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Examiners' Report
January 2013

GCE Biology 6BI02 01

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Introduction

There were some good attempts at this paper, with candidates showing a good understanding of many aspects of the AS course, although application of knowledge derived from practical skills was less well demonstrated. It is important that candidates appreciate that they should be able to apply their knowledge and therefore need to understand the concepts covered, and not just cram facts.

It was the general feeling amongst examiners, at all levels, that poor grammar, spelling and illegibility continue to present problems. Many candidates lost marks, not because of lack of biological knowledge, but as a direct consequence of being unable to express themselves clearly and concisely using appropriate scientific language. On the whole, grammar, vocabulary, spelling and syntax were of a worryingly low standard and some handwriting was very difficult to read, in some cases bordering on illegible. Whilst this is an examination testing knowledge and understanding of Biology, it is essential that candidates have the skills in written English to be able to express their knowledge unambiguously and clearly. The mark scheme does not reward mere mention of the correct words or phrases, but seeks the use of these terms in the correct context.

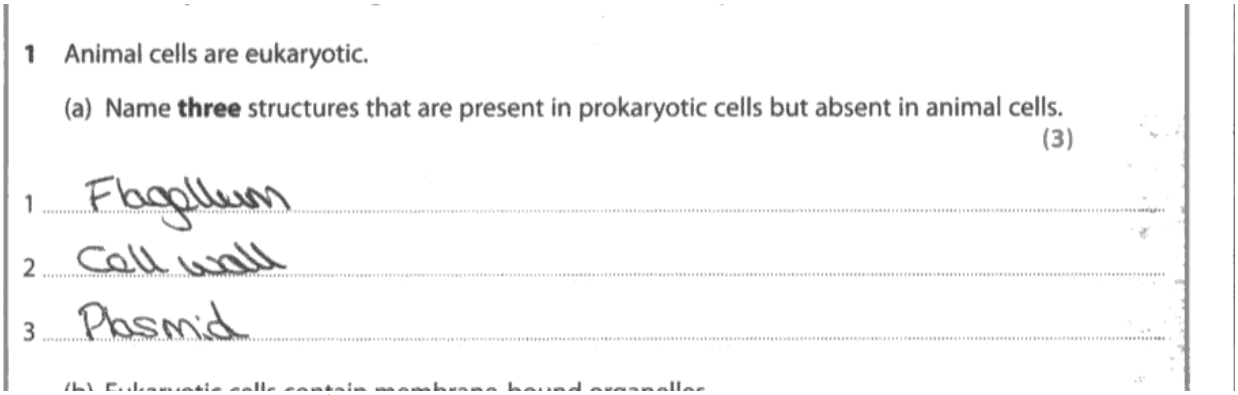
There are still issues with lack of understanding of practical procedures, which can only be improved by carrying out the core practicals as detailed in the specification.

Question 1 (a)

Generally, this question was well answered. However, when a question asks for **'three'** structures and there are spaces for 3 responses, clearly numbered 1, 2 and 3, it is advisable to stick to three and not to write several possibilities on each line. When candidates provide more answers than requested, they cannot expect an examiner to pick the three correct ones from a list and just ignore all the incorrect guesses.

The commonest error was providing 'flagellum' as an example, even though candidates should have studied the structure of human gametes for this paper, and should have been aware of the fact that sperms cells are animal cells which possess a flagellum.

Other errors included 'plastid' instead of 'plasmid' and 'capsid' instead of 'capsule'.


1 Animal cells are eukaryotic.

(a) Name **three** structures that are present in prokaryotic cells but absent in animal cells. (3)

1 Flagellum

2 Cell wall

3 Plasmid

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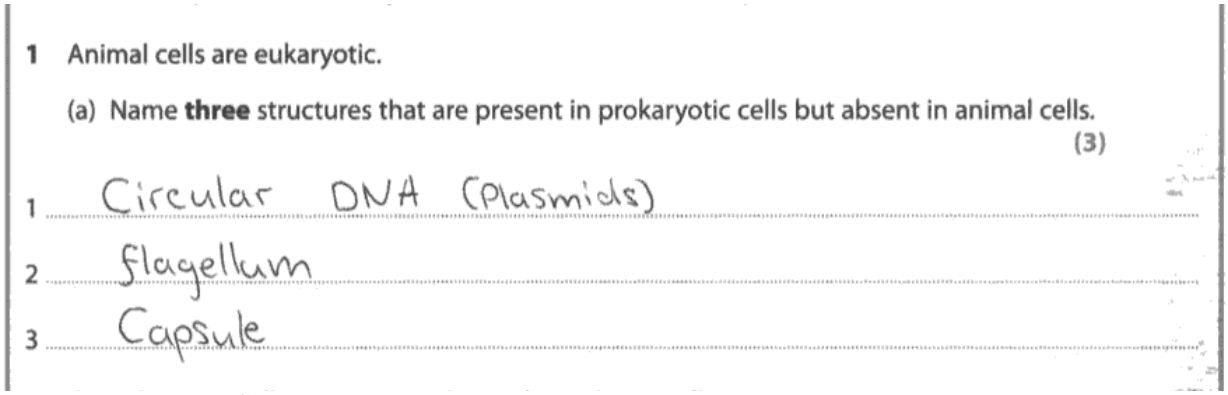
Examiner Comments

A typical response scoring 2 marks, with 'flagellum' evidently a confident response.


1 Animal cells are eukaryotic.

(a) Name **three** structures that are present in prokaryotic cells but absent in animal cells. (3)

1 Circular DNA (Plasmids)

2 flagellum

3 Capsule

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Examiner Comments

If this candidate had provided circular DNA and plasmids on separate lines and not given flagellum as their second response, they would have gained 3 marks instead of 2.

Question 2 (a)

Well answered on the whole. Most realised that 'zygote' was the correct word for the first gap, although some put 'embryo' and others put 'embryo/zygote' as if not quite sure - this however, had to be marked as incorrect as two answers were provided instead of one. Students should be advised that answers cannot be multiple choice.

Calculating the number of cells produced after 4 divisions of the zygote proved challenging to many candidates with many figures quoted, although many drew diagrams to assist their reckoning. Those who gave totipotency and pluripotency as answers, almost always put them in the correct places, clearly understanding the difference between these two states.

2 A scientist wanted to use stem cells to develop a new treatment for adults with Alzheimer's disease.
These stem cells could come from an embryo or an adult.

(a) Read through the following passage on the use of embryos as a source of stem cells, then write on the dotted lines the most appropriate word or words to complete the passage.

(4)

When an egg cell becomes fertilised, it is called a gamete .

After the first cell division there are two cells and after the fourth division the number of cells is 16 .

Each of these cells has the potential to give rise to any type of cell and is therefore said to be undifferentiated

After approximately five days, a mass of cells forms called a blastocyst.

Scientists can extract stem cells from the blastocyst, which are said to be specialised , as they can give rise to most cells, but not extra-embryonic cells.

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Examiner Comments

This only gets one mark for '16'.

This candidate has not clearly read the descriptions of totipotency and pluripotency. Also the use of 'gamete' in the first line indicates a poor grasp of the processes involved.

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Examiner Tip

Learn definitions for key biological terms so that you can recognise them and use them appropriately.

2 A scientist wanted to use stem cells to develop a new treatment for adults with Alzheimer's disease.
These stem cells could come from an embryo or an adult.

(a) Read through the following passage on the use of embryos as a source of stem cells, then write on the dotted lines the most appropriate word or words to complete the passage.

(4)

When an egg cell becomes fertilised, it is called a an embryo.

After the first cell division there are two cells and after the fourth division the number of cells is 16.

Each of these cells has the potential to give rise to any type of cell and is therefore said to be totipotent.

After approximately five days, a mass of cells forms called a blastocyst.

Scientists can extract stem cells from the blastocyst, which are said to be pluripotent, as they can give rise to most cells, but not extra-embryonic cells.

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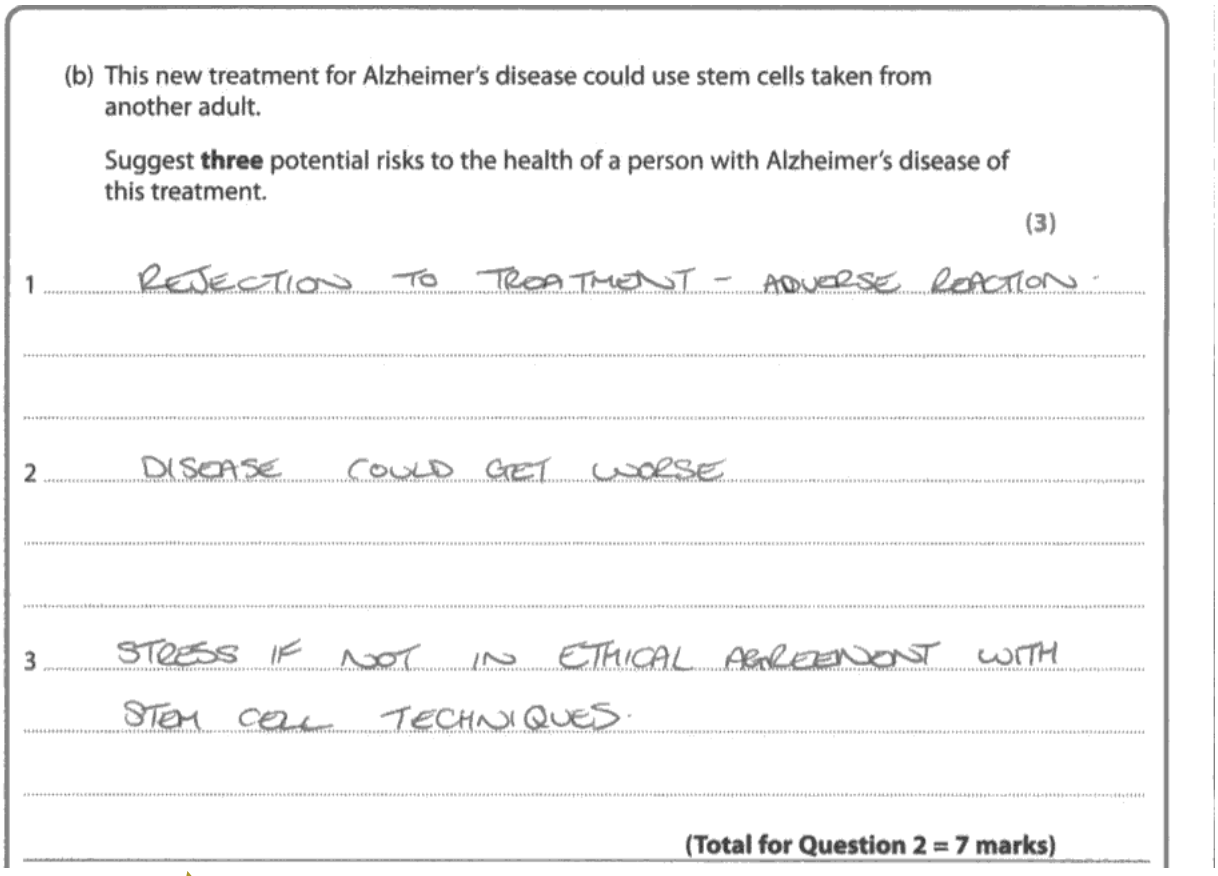
Examiner Comments

The diagram here shows how the candidate has worked out how many cells would be present. This is a sensible course of action and far better than guessing!

However, one mark is lost for 'embryo' instead of 'zygote' so this scored 3 marks.

Question 2 (b)

This question was generally well answered by the majority of candidates with most scoring at least one mark. However, a common error was referring to 'infection' without citing a source of the infection. Most candidates were able to state 'rejection' or refer to the risk of 'uncontrolled cell division'. Only a handful referred to immunosuppressant drugs and then often failed to state the problems of using them. There were many references to the procedure making Alzheimer's worse, or it causing pain or discomfort to the patient. Many students considered that health issues could arise from using another adult's pluripotent stem cells where they did not differentiate into the desired cells/tissue, yet did not explain how that could affect health, for example by describing the 'risk of abnormal or cancerous growth'.



(b) This new treatment for Alzheimer's disease could use stem cells taken from another adult.

Suggest **three** potential risks to the health of a person with Alzheimer's disease of this treatment.

(3)

1 REJECTION TO TREATMENT - ADVERSE REACTION.

2 DISEASE COULD GET WORSE

3 STRESS IF NOT IN ETHICAL AGREEMENT WITH STEM CELL TECHNIQUES.

(Total for Question 2 = 7 marks)

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Examiner Comments

This response only gained one mark for reference to rejection leading to an 'adverse response'. This is a typical example of answers lacking in detail and failing to gain marks.

(b) This new treatment for Alzheimer's disease could use stem cells taken from another adult.

Suggest **three** potential risks to the health of a person with Alzheimer's disease of this treatment.

(3)

1 Weakened immune system due to anti-rejection drugs.

2 Transfer of [illegible] disease from one patient to the other.

3 Stem cells have the potential to differentiate into cancerous cells.

(Total for Question 2 = 7 marks)

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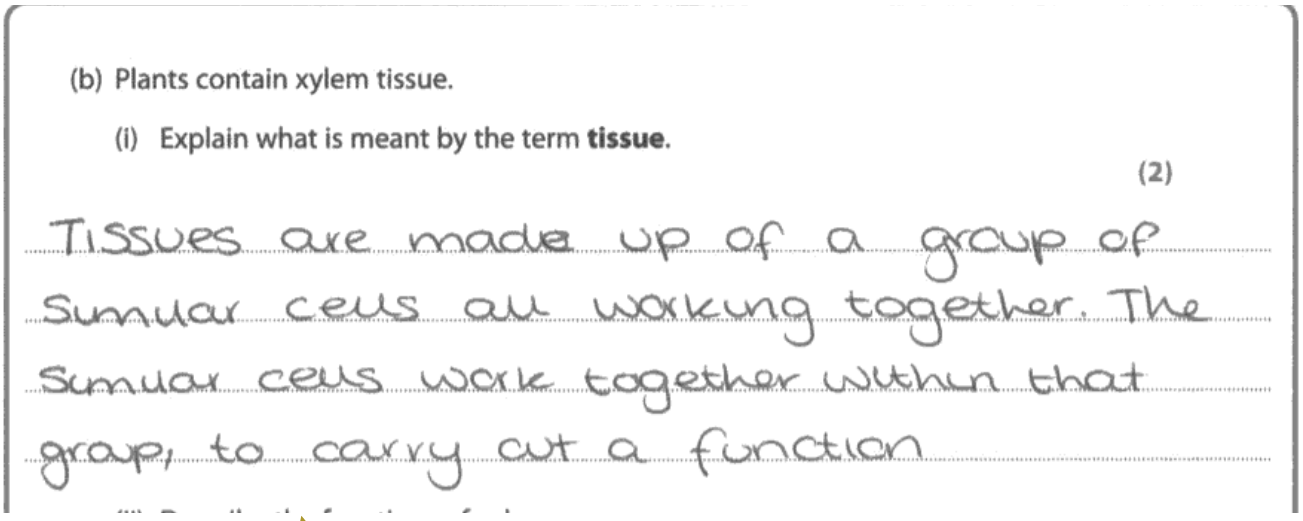
Examiner Comments

This is a good response - clearly covering 3 separate marking points, concerning the impact of immunosuppressant drugs, transmission of disease from the donor and the possibility that stem cells could become cancerous.

Question 3 (b) (i)

This question proved troublesome for the type of candidate who struggles to phrase descriptions of biological structures. A simple reference to groups of cells working together to carry out a function is all that is required, yet many left out the important aspect of these cells working together as a collective.



(b) Plants contain xylem tissue.

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

(2)

Tissues are made up of a group of Sumular cells all working together. The Sumular cells work together within that grap, to carry out a function

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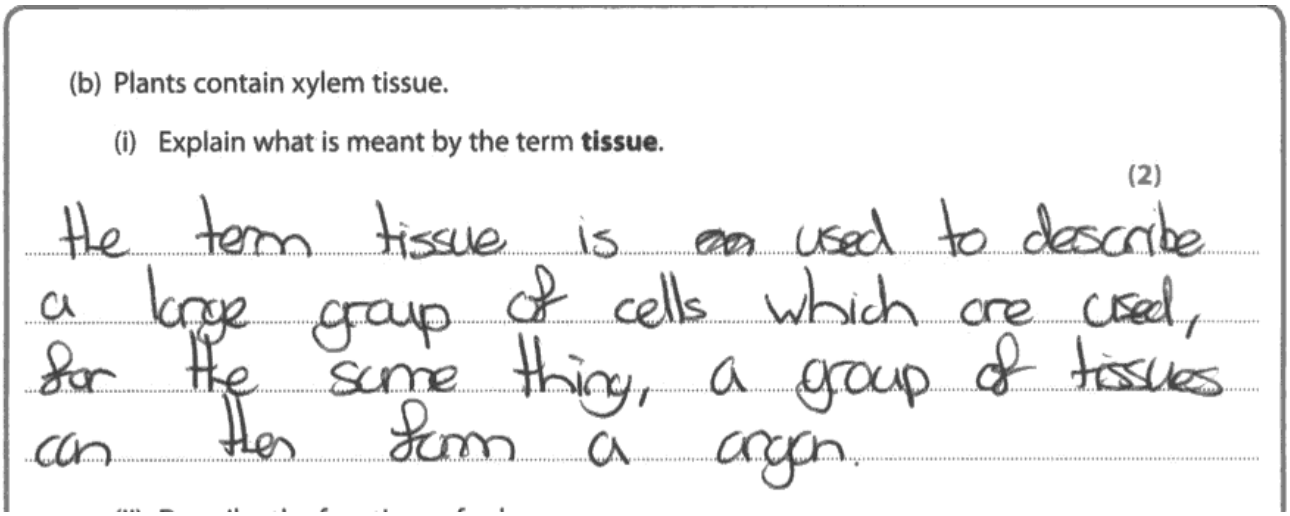
Examiner Comments

A nice clear response referring to tissues as groups of similar cells working together for a function. 2 marks.



(b) Plants contain xylem tissue.

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

(2)

the term tissue is can used to describe a large group of cells which are used, for the same thing, a group of tissues can then form a organ.

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Examiner Comments

This response gains one mark for reference to 'group of cells'. However, 'used for the same thing' is not sufficient description to gain a second mark.

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Examiner Tip

It's really important to use precise language to gain full marks.

Question 3 (b) (ii)

Many achieved full marks here, grasping the context of function rather than structure of xylem. However, many referred to transport of 'nutrients' instead of 'mineral ions'. At this level, it is expected that candidates do not confuse the two. Also, references to water in the xylem providing support by making the tissue turgid were also rejected - turgidity comes about due to water moving into the vacuoles of living tissue, not water filling the xylem.

(ii) Describe the functions of xylem.

(2)

for smuctural support and transport of water and mineral ions through the plant.

ResultsPlus
Examiner Comments

A clear example of a response that gains full marks. Refers to 'structural support' and transport of 'water and mineral ions'.

(ii) Describe the functions of xylem.

(2)

Transport water / nutrients to the plant from the roots. xylem contains lignin so it also supports the plant, making it more turgid.

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Examiner Comments

Only one mark can be given for reference to transporting water. No marks for 'nutrients' or reference to 'support' in the context of turgidity.

Question 3 (c)

Many candidates scored high marks on this question and there were some excellent answers that used precise language going far in excess of the maximum number of marks. Where candidates gave thorough, carefully worded answers they gained good credit, but far too many were careless with descriptions. Many candidates did gain 4 marks and QWC was reasonably good.

Many other candidates, however, were too imprecise with their answers, often implying that hydrogen bonds link glucose monomers in the polysaccharide chain, or that cellulose simply has glycosidic bonds (not suggesting where they form). Vague reference to glycosidic and hydrogen bonds is not enough to score marks on questions concerning the structure of molecules. Sometimes it was not clear whether glucose or cellulose was the molecule being described at various points in an answer.

There were even a few responses that described the structure of starch instead of cellulose.

The structure of a cellulose microfibril was also erroneously interpreted by many as the positioning of microfibrils in the primary and secondary wall cell wall, which was described in depth, including references to pectate and hemicellulose.

*(c) Plant cells may contain cellulose.

Describe the structure of a cellulose microfibril. (4)

chains of cellulose molecules.
Molecules held together by glycocyclic bonds - between each molecule.
Chains held together on diagonal bonds - hydrogen bonds.

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Examiner Comments

No marks could be awarded to this response. There is no reference to glucose molecules being held together by glycosidic bonds - which, although mentioned, is spelt incorrectly.

If this answer had referred to chains of beta glucose making up cellulose, and that these chains were held together by hydrogen bonds, then two marks could have been awarded.

ResultsPlus
Examiner Tip

Take care with reference to bonds - be precise and state clearly which molecules are joined by which bonds.

*(c) Plant cells may contain cellulose.

Describe the structure of a cellulose microfibril.

(4)

Cellulose microfibril is made up of beta glucose ~~held in~~ joined by 1-4 glycosidic bonds to form parallel, ~~The parallel chains are~~ straight chains. The chains ~~are~~ then forms hydrogen bonds between ~~the~~ each layer. 50-80 cellulose molecules form a cellulose microfibril.

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Examiner Comments

This response clearly refers to 1-4 glycosidic bonds between beta glucose molecules. There is reference to straight chains being formed and that 50-80 of these chains are held together by hydrogen bonds to form a microfibril. 4 marks.

*(c) Plant cells may contain cellulose.

Describe the structure of a cellulose microfibril.

(4)

Cellulose microfibrils are held together in a matrix of hemicellulose. ~~This helps to~~ The primary structure is made up of calcium pectate and the microfibrils are arranged in the same direction. The secondary structure has the microfibril arranged in different directions ~~This helps them to have~~ It can also contain lignin.

(Total for Question 3 = 11 marks)

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Examiner Comments

This response does not answer the question and scored no marks - it describes the arrangement of microfibrils within the cell wall instead of the structure of a cellulose microfibril.

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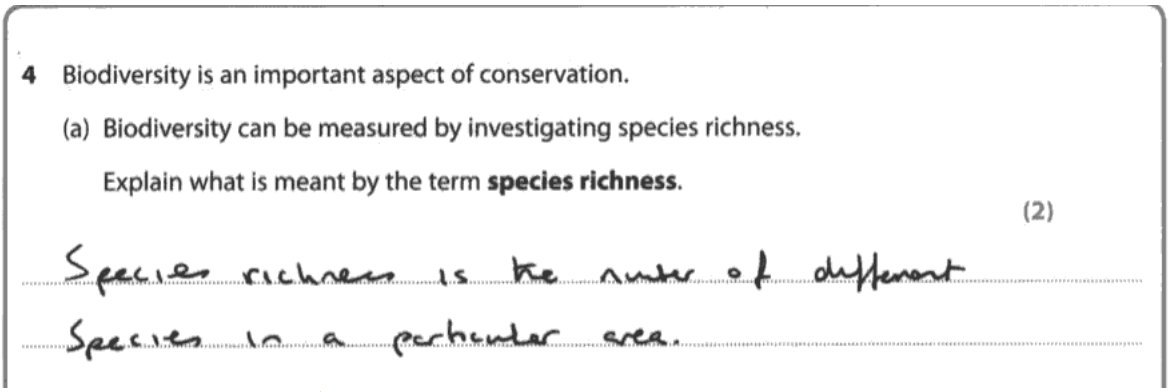
Examiner Tip

Read the questions with care - do not skim read, or important details may be missed.

Question 4 (a)

Despite this being a fairly straightforward question asking for a definition of 'species richness' in the context of biodiversity, there were many candidates who failed to produce a clearly worded answer. Many candidates seemed intent on hedging their bets by using as many associated terms as possible, with a range of combinations of the following: area, location, environment, ecosystem, habitat, part of the world, population and community.

What we were looking for was a simple statement along the lines of 'the number of different species in a particular area' - in this case habitat would be acceptable. Neither an ecosystem nor an environment has a defined size, therefore it is not possible to measure the species richness of either of these.



4 Biodiversity is an important aspect of conservation.

(a) Biodiversity can be measured by investigating species richness.

Explain what is meant by the term **species richness**.

(2)

Species richness is the numb of different Species in a particular area.

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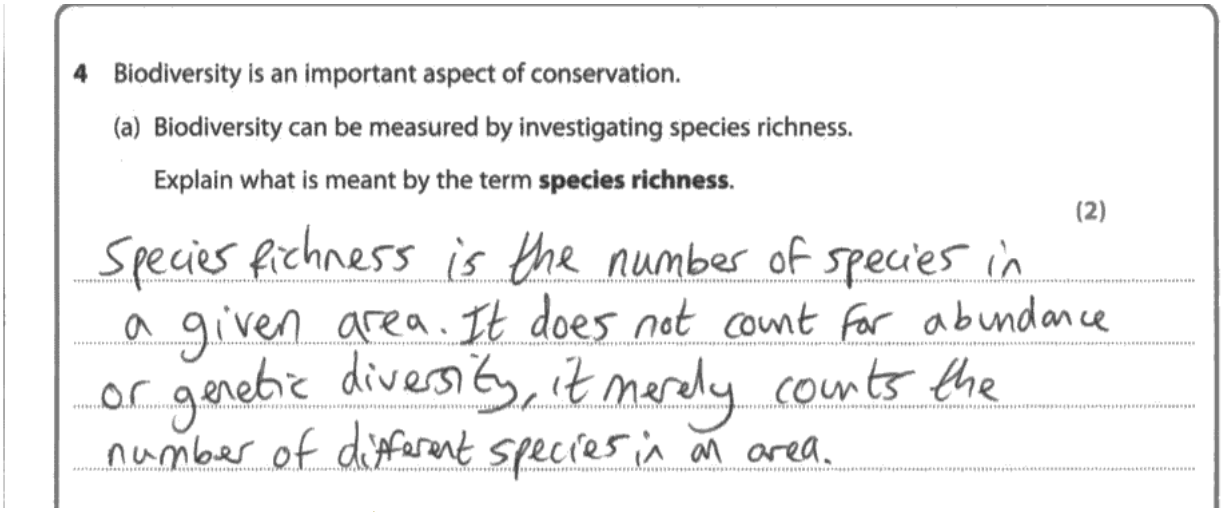
Examiner Comments

Simple, precise response gains both marks.



4 Biodiversity is an important aspect of conservation.

(a) Biodiversity can be measured by investigating species richness.

Explain what is meant by the term **species richness**.

(2)

Species richness is the number of species in a given area. It does not count for abundance or genetic diversity, it merely counts the number of different species in an area.

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Examiner Comments

This response gains two marks for clearly recognising that species diversity refers to the number of different species in an area.

Question 4 (b) (i)

This was often found quite challenging by many candidates and imprecision with answers caused many to lose marks. A fair proportion of candidates mentioned a reduction in the number of species/reduced biodiversity, but many suggested that species would disappear completely. Many simply suggested all species would become extinct, or 'even the dandelions and ribwort' disappear. Only about half the candidates gave specific references to the species listed in the table – disappointing, when the question clearly instructs candidates to 'use information in the table'.

Again, however, those candidates that gave careful, precise answers gained credit. Candidates are often far too inclined not to use key terminology such as 'biodiversity', instead waffling around the point. Better answers considered the reduced competition for dandelion and ribwort plantain and the impact on other organisms in food webs.

There were very few references to competition and the impact on food chains, but better responses referred to the lack of competition for resources increasing the populations of ribwort plantain and dandelion. There were also some well considered responses that took into account the effects on other species that depend on the range of species for food and shelter.

(i) Using information from the table, suggest possible long-term effects on chalk grassland of public access.

(2)

The more the public can access the chalk grassland the less species there will be present, so there will be less biodiversity

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Examiner Comments

This response gains one mark for reduced biodiversity - the commonest mark awarded for this answer.

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Examiner Tip

If the question includes the instruction 'Using information in...' it is wise to do so!

(i) Using information from the table, suggest possible long-term effects on chalk grassland of public access.

(2)

- Reduce biodiversity as public footpaths have only two species of plants growing on them
- Effect the food web as some species may feed off on the plants that only grow on undisturbed grassland

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Examiner Comments

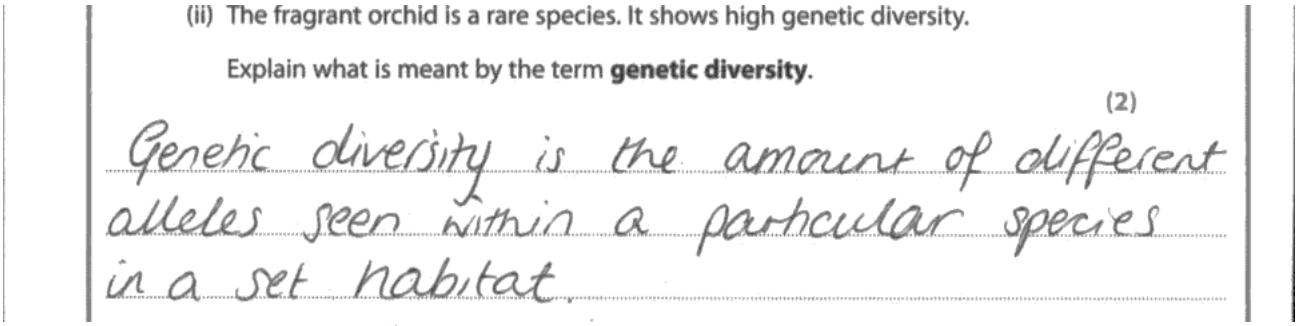
This response refers to reduced biodiversity and links the lack of certain species with the effects on organisms that feed on them. 2 marks.

Question 4 (b) (ii)

Another question asking for a basic definition of a term. Unfortunately, many candidates chose to define 'high genetic diversity' rather than just 'genetic diversity', despite the clarity of the actual question.

The most common error made by candidates who were on the right track, was referring to the number/variation/ variety of **genes** instead of **alleles**.

There were many responses that indicated lack of understanding of this term - even some referring to numbers of species in an area.



(ii) The fragrant orchid is a rare species. It shows high genetic diversity.

Explain what is meant by the term **genetic diversity**.

(2)

Genetic diversity is the amount of different alleles seen within a particular species in a set habitat.

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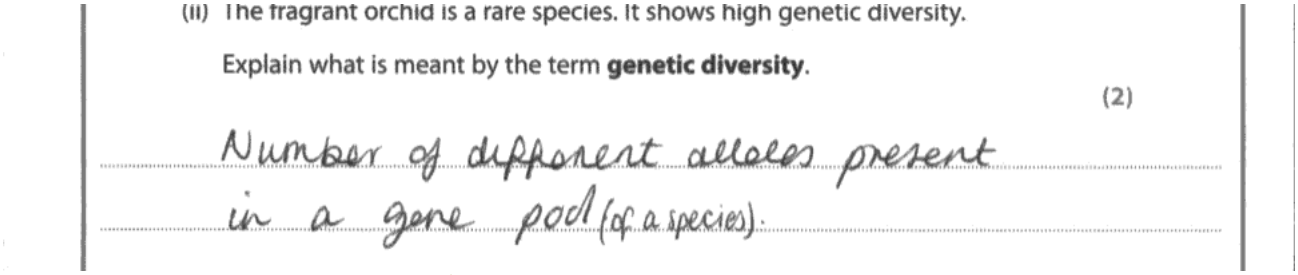
Examiner Comments

This is a nice clear response, showing a good grasp of the meaning of genetic diversity. The language used is precise and unambiguous making it easy to award full marks to.



(ii) The fragrant orchid is a rare species. It shows high genetic diversity.

Explain what is meant by the term **genetic diversity**.

(2)

Number of different alleles present in a gene pool (of a species).

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Examiner Comments

Another clear answer that uses correct terminology to gain full marks.

Question 4 (c) (i)

Most candidates were able to gain at least 1 mark here but only the better, more thorough responses gained full credit. The most common marks gained were for cost and maintenance. Many almost gained credit for the idea of small size but failed to go on to state many could be stored. A large number were similarly unsure as to what impact this has on genetic diversity, often implying that the seed storage would increase genetic diversity rather than comparing it to what would happen with plant storage.

(c) Seedbanks are important for the long-term conservation of rare plant species.

(i) Suggest and explain why it is better to store seeds, rather than keeping fully grown plants, for the long-term conservation of rare plant species.

(3)

Seeds are smaller in size ~~and~~ which means more seeds can be stored in a space than fully grown plants. Also drying out seeds and storing them in cold temperatures means they can be stored for a longer period of time than fully grown plants can.

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Examiner Comments

This response gains 2 marks - one for the idea that because seeds are smaller, more can be stored, and one for the idea of seeds being able to be stored for a longer period of time.

(c) Seedbanks are important for the long-term conservation of rare plant species.

(i) Suggest and explain why it is better to store seeds, rather than keeping fully grown plants, for the long-term conservation of rare plant species.

(3)

Seed take up less space so you can keep more, they can be kept much longer than plants, plants normally ~~produce~~ produce lots of seeds so if taking them shouldnt effect the plants numbers. As seeds take up less space you can collect them from many plants of a rare species, this increases genetic diversity & decreases the chance of plants having a disease.

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Examiner Comments

A good answer, which scored full marks, indicating an understanding that as seeds take up less space, more can be stored. It also referred to seeds being able to be kept for longer.

There's also reference to increased genetic diversity as seeds from many plants of one species can be stored.

Question 4 (c) (ii)

Most candidates referred to the conditions described preventing germination, but many candidates did not use that term and referred to growth instead, which was not sufficient to gain the mark; at this level we would expect candidates to use the term 'germinate'. Many picked up on the idea of reduced enzyme activity, but not all linked it to either the seed or micro-organisms. Good responses referred to reduced enzyme activity in relation to the metabolic activity in the seeds.

Some responses mentioned the conditions stopping the seeds from 'rotting', poorly phrasing the concept of reduced rate of decay or decomposition.

Quite a few referred to drying preventing freezing at low temperatures.

Although all four marking points were seen, many candidates only achieved two marks. 'Seeds not germinating' was the most popular answer, followed by references to decreasing rates of decomposition.

(ii) In seedbanks, dried seeds are stored at low temperatures and in a dry atmosphere.

Suggest why these conditions are needed for seed storage.

(3)

Water triggers ↑ metabolic reactions in the seed and on receiving water, the seed will begin to grow; a dry atmosphere ensures the seeds remain stagnant. Low temperature ensures it is too cold for enzymes to function and for bacteria to cause the seeds to decay. These conditions elongate the time for which the seeds may be stored.

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Examiner Comments

This response gained one mark for stating that in the presence of water there would be germination as it is needed for metabolic reactions, the converse argument for stating lack of water prevents metabolic reactions. One mark was also given for low temperatures preventing the bacterial decay of the seeds.

(ii) In seedbanks, dried seeds are stored at low temperatures and in a dry atmosphere.

Suggest why these conditions are needed for seed storage.

(3)

Drying seeds prolong survival and inhibits germination. Low temperatures stop growth of bacteria and reduce freezing effect.

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Examiner Comments

This gains two marks - one for inhibiting germination and one for stopping the growth of bacteria.

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Examiner Tip

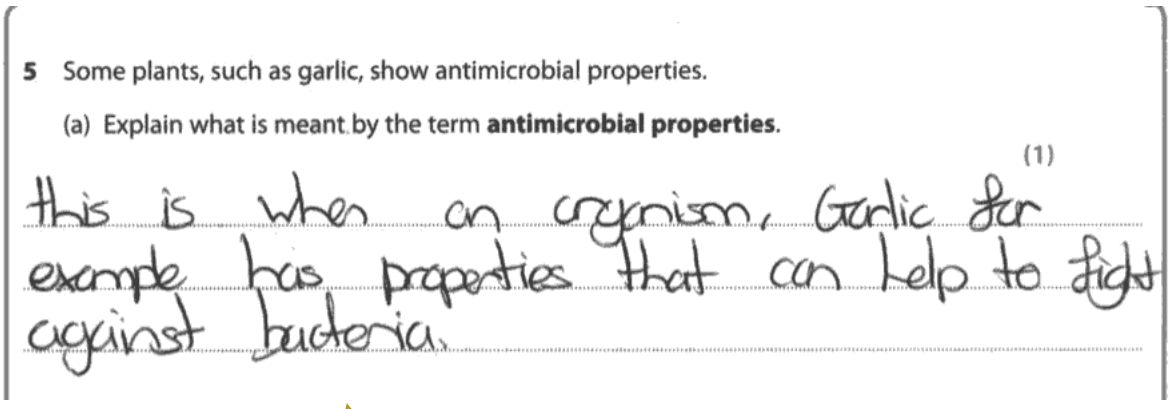
Go that little bit further to gain more marks - explain why low temperatures and dry conditions would reduce germination and stop the growth of bacteria.

Remember that the effects of temperature on enzymes underpin the overall effects of temperature on any living organism.

Question 5 (a)

It was surprising how many candidates got this question wrong, appearing mystified by the phrase or incapable of explaining it succinctly. Many described antimicrobials as fighting the bacteria (not saying they killed or destroyed the bacteria). There were also a large number of responses along the lines of 'the plants are protected against microbes' without explaining how.

There were relatively few correct references to antimicrobials either inhibiting the growth of microbes or killing them.



5 Some plants, such as garlic, show antimicrobial properties.

(a) Explain what is meant by the term **antimicrobial properties**.

(1)

this is when an organism, Garlic for example has properties that can help to fight against bacteria.

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An example of 'fighting against bacteria' - which doesn't really say anything and was not awarded the mark.

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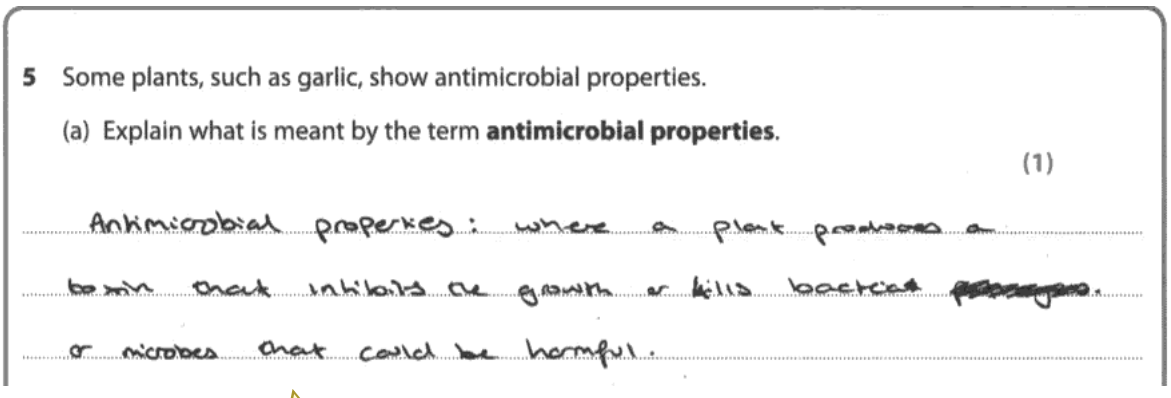
Examiner Tip

Precise language gains marks. Antimicrobials either kill micro-organisms or inhibit their growth



5 Some plants, such as garlic, show antimicrobial properties.

(a) Explain what is meant by the term **antimicrobial properties**.

(1)

Antimicrobial properties : where a plant produces a toxin that inhibits the growth or kills bacterial pathogens. or microbes that could be harmful.

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Examiner Comments

A good answer explaining how plants produce toxins that kill or inhibit the growth of bacteria.

5 Some plants, such as garlic, show antimicrobial properties.

(a) Explain what is meant by the term **antimicrobial properties**.

(1)

the ability to inhibit the growth of microorganisms, or kill micro organisms.

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Examiner Comments

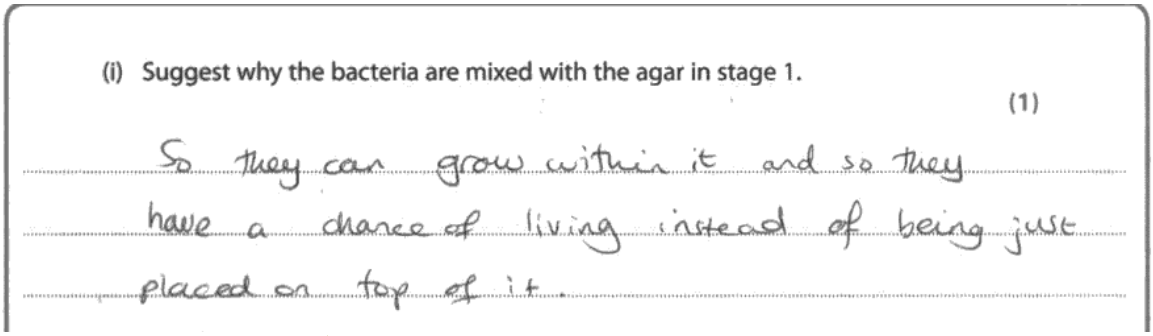
Clearly phrased answer covering both marking points.

Question 5 (b) (i)

There were two alternative types of answer acceptable here - candidates could either refer to the provision of nutrients by the agar, allowing the bacteria to grow, or to the even distribution of bacteria throughout the agar.

Incorrect responses were those that tended to be too vague, e.g. agar is a good medium for growth (without saying why) or focusing on how it would make it easier to see how the bacteria worked.

Many candidates achieved this mark.



(i) Suggest why the bacteria are mixed with the agar in stage 1.

(1)

So they can grow within it and so they have a chance of living instead of being just placed on top of it.

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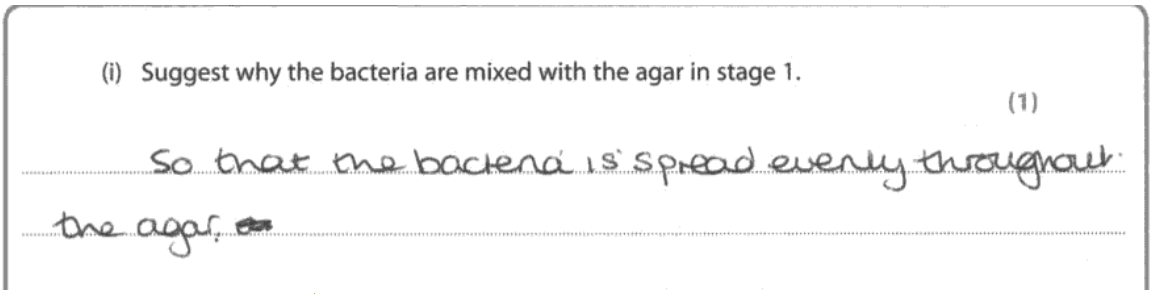
Examiner Comments

This is typical of the type of vague answer that doesn't really say anything and doesn't gain marks. It is not the standard of answer required at this level.



(i) Suggest why the bacteria are mixed with the agar in stage 1.

(1)

So that the bacteria is spread evenly throughout the agar.

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Examiner Comments

This response shows a familiarity with the procedure and an understanding of what is required from the question.

Question 5 (b) (ii)

This question was accessible to the majority of candidates, with most gaining at least one mark and many two. The majority were able to recognise the idea of contamination, although weaker candidates often referred to contamination by chemicals or dust. In fact, most candidates did not specifically refer to contamination, although they had got the idea that bacteria were being inhibited from growing. Fewer discussed competition, but there were plenty of references to the growth of pathogenic bacteria.

Some candidates understood the term 'valid', but there were many answers of the line of 'it is more accurate, reliable, valid and a fair test'. There are still a large number of candidates confused about the differences between reliability, validity and accuracy. It may be best to think of an investigation or procedure as being valid, results being reliable and measurements being accurate. There were more references to this precaution producing reliable results, than references to validity.

(ii) Explain why the Petri dish must be sterile at stage 2.

(2)

kill all microorganisms that could compete with bacteria and interupt experiment, keep it a valid test.

ResultsPlus
Examiner Comments

Good answer that covers 3 marking points - killing any micro-organisms that could compete with the bacteria and keeping the test valid.

(ii) Explain why the Petri dish must be sterile at stage 2.

(2)

So there is no competition from other bacteria. Prevent contamination and growth of other bacteria.

ResultsPlus
Examiner Comments

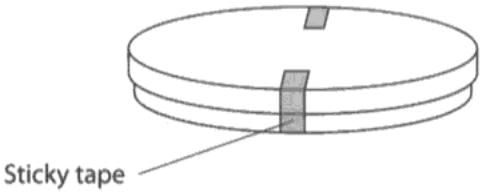
This answer clearly address prevention of contamination and reduced competition to gain 2 marks.

Question 5 (b) (iii)

There were some surprising answers to this question. Considering that this question is based on a core practical, it is expected that candidates should be familiar with the procedures and understand why Petri dishes are taped the way they are. There were many vague responses about avoiding condensation or protecting humans from bacteria getting out, saving money as less tape was used or needing to see inside. There were also references to making it easier to open the dishes after incubation - a practice that should be avoided in school laboratories.

When plates are incubated they are often turned upside down to prevent condensation from dripping onto the surface of the agar, and although candidates may not be aware of this, they should know that minimal taping is to ensure the entry of oxygen to allow aerobic respiration by the bacteria being cultured and to prevent the development of anaerobic conditions that could encourage the growth of unwanted pathogenic bacteria.

(iii) In stage 3, the lid is taped on using two pieces of sticky tape as shown below.



Explain why the two halves of the Petri dish are not completely sealed with sticky tape.

(2)

So that the bacteria is not grown in anaerobic conditions. This could make the bacteria a lot more harmful when the plate is opened. Gets into the air. harmful spores to humans.

ResultsPlus
Examiner Comments

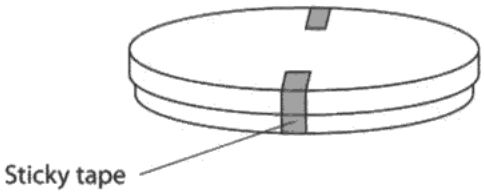
This is an example of the common misconception that the bacteria will become harmful if allowed to grow in anaerobic conditions. Either that or poor wording conveying a different meaning than the candidate intended. 1 mark.

ResultsPlus
Examiner Tip

Be very careful with phrasing - 'this could make the bacteria a lot more harmful' implies that the bacteria being grown become harmful and not that anaerobic conditions encourage the growth of harmful bacteria.

Poorly worded answers lose marks, even when the candidate knows what they mean.

(iii) In stage 3, the lid is taped on using two pieces of sticky tape as shown below.



Explain why the two halves of the Petri dish are not completely sealed with sticky tape.

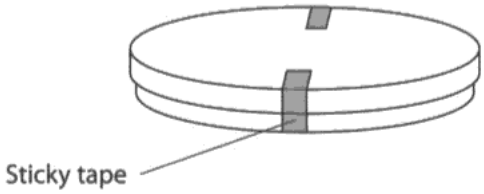
(2)

This allows oxygen in the air to get through for aerobic respiration in the bacteria.

ResultsPlus
Examiner Comments

A good example of a 2 mark answer - this candidate understood that oxygen has to enter in order for the bacteria to respire aerobically.

(iii) In stage 3, the lid is taped on using two pieces of sticky tape as shown below.



Explain why the two halves of the Petri dish are not completely sealed with sticky tape.

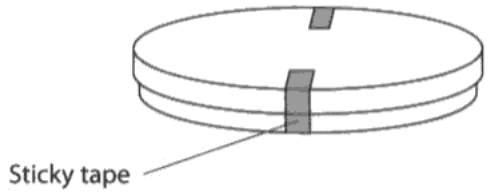
(2)

To allow the bacteria to respire and it makes it easier to open so the contents aren't spilt everywhere.

ResultsPlus
Examiner Comments

An example of a candidate whose grasp on aseptic technique is worrying. Petri dishes in which bacteria have been cultured should not be opened in school laboratories. No marks.

(iii) In stage 3, the lid is taped on using two pieces of sticky tape as shown below.



Explain why the two halves of the Petri dish are not completely sealed with sticky tape.

(2)

The reactions which take place must be aerobic as anaerobic products of reactions are highly toxic to humans and must be disposed of in an industrial furnace.

ResultsPlus
Examiner Comments

Despite references to 'aerobic' and 'anaerobic', this response seems to be written by someone completely unfamiliar with the core practical and scored no marks.

Question 5 (b) (iv)

Although this question appeared to be very accessible, it drew a surprising number of poor answers. There were quite a few suggestions of 37 °C (for 'maximum growth rate' as body temperature was identified as optimum for growth), or ranges from 20 - 40 °C. A large number of candidates thought that the bacteria being cultured would automatically become pathogenic once temperatures exceeded 30°C. Many stated that if the temperature was too high it would cause denaturation. Some had the idea that a lower temperature was necessary to prevent the growth of pathogenic bacteria, without reference to body temperature.

(iv) Suggest a suitable temperature for the safe incubation of the agar plates in a school laboratory. Give an explanation for your answer.

(2)

A suitable temperature would be 25°C. At this temperature harmful bacteria (to humans) cannot grow so this is why it is safe

ResultsPlus
Examiner Comments

Typical answer gaining one mark for suggestion of a suitable temperature. However, the second mark cannot be awarded without referring to the temperature at which the growth of pathogenic bacteria would be encouraged.

(iv) Suggest a suitable temperature for the safe incubation of the agar plates in a school laboratory. Give an explanation for your answer.

(2)

25°c. Room temperature allows the species of bacteria to grow without encouraging other harmful bacteria. Higher temperatures such as 35°c are close to human body temperature so could encourage harmful bacteria to grow.

ResultsPlus
Examiner Comments

This response gained 2 marks, appreciating the need for a temperature that would allow bacteria to grow, whilst remaining below 35°C as that temperature would be close to human body temperature which would encourage the growth of harmful bacteria.

ResultsPlus
Examiner Tip

Read the question - if asked to provide an explanation, make sure you do - it's worth marks that won't be awarded unless an explanation is given.

(iv) Suggest a suitable temperature for the safe incubation of the agar plates in a school laboratory. Give an explanation for your answer.

(2)

121°C. the enzyme in the garlic extract can work normally at this. so that we can get accurate results. enzyme will be best active at this temperature, so the enzymes can easily kill off the bacteria present.

ResultsPlus
Examiner Comments

This candidate has thought of the need for a temperature at which enzymes in the garlic would be active, so they haven't really considered the idea of incubation of bacteria. Also the temperature suggested of 121°C would not only denature the enzymes, but also kill the bacteria. This response gained no marks.

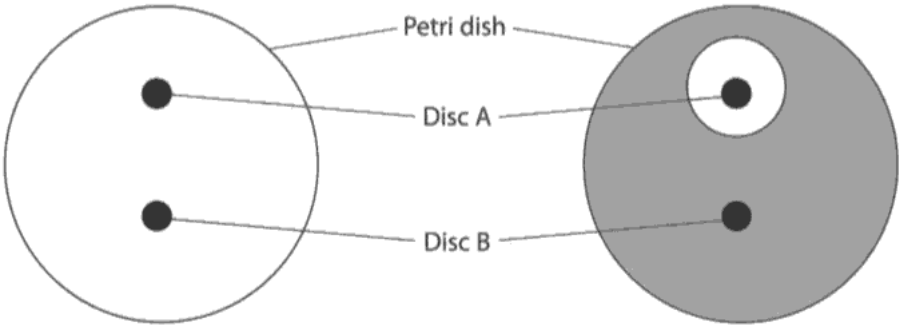
ResultsPlus
Examiner Tip

Understand the range of temperatures encountered by living systems - it is basic knowledge that water freezes at 0°C and boils at 100°C -and as living organisms are mostly made of water, it applies to them too.

Question 5 (b) (v)

Most candidates correctly identified the clear area or correctly referred to the zone of inhibition and then went on to state that the garlic had inhibited bacterial growth or killed the bacteria. Many said that garlic had antimicrobial properties – as stated within the information provided in the question - but didn't explain that it had killed or inhibited the growth of the bacteria. Fewer pointed out that no bacteria were in the clear zone and only the best responses referred to diffusion. Most candidates were able to gain at least one mark.

(v) The diagrams below show the Petri dish at the beginning and end of stage 4.



Beginning of stage 4 **End of stage 4**

Describe and explain the results shown at the end of stage 4.

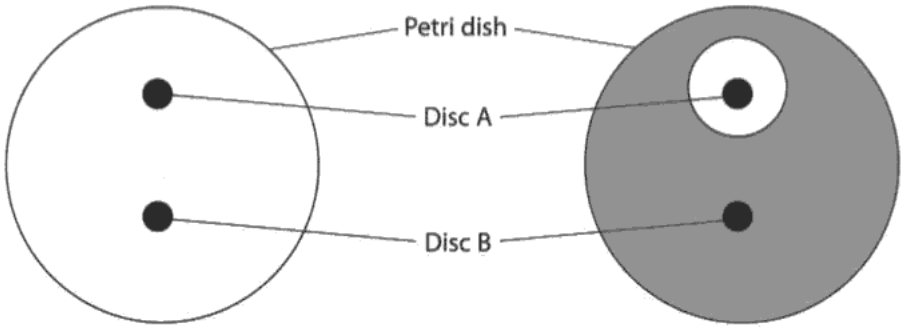
(3)

There is a inhibition zone around disc A which shows that the extract diffused out of the disc and either killed or inhibited bacterial growth. The control disc B is to show that it is not the paper that is inhibiting bacterial growth. The petri dish is covered by a "lawn of bacteria" only around disc A there isn't any bacteria.

ResultsPlus
Examiner Comments

A good example - this gained full marks. One mark for reference to 'inhibition zone', one for diffusion of extract out of the disc, one for extract being responsible for killing or inhibiting the growth of the bacteria. Another mark could also have been given for stating that there were no bacteria around disc A.

(v) The diagrams below show the Petri dish at the beginning and end of stage 4.



Beginning of stage 4 **End of stage 4**

Describe and explain the results shown at the end of stage 4.

(3)

Disc A at the ~~b~~ end of stage 4 shows an antimicrobial ring, whereas Disc B does not. Both disc A and B have no ring at the beginning. Disc A at the end of stage 4 shows antimicrobial properties, whereas Disc B does not, therefore showing no antimicrobial activity. Bacteria has been produced from disc A.

ResultsPlus

Examiner Comments

An example of a candidate writing a lot, but not saying very much.

This response gained no marks. Nothing could be given for reference to 'antimicrobial ring'.

The last sentence referring to bacteria being produced from disc A is confusing and suggests that this candidate did not re-read their answers to make sure they made sense.

Question 6 (a)

This was surprisingly poorly answered and largely due to imprecise use of language and poor levels of detail. Strong candidates took a 'linear' approach to the question and gave detailed precise methods that presented a well planned investigation. Experimental planning questions should be accessible to all candidates if they are prepared to give careful, detailed, well considered answers.

The mark for 'genetically similar plants' was achieved by a small proportion of candidates, many either only referring to plants of the same species, or, at the other extreme, suggested using 'genetically identical seeds'. A far larger number of candidates correctly referred to using plants of the same age or size initially.

Regarding the range of nitrate concentrations to be used, many made vague references to 'a few different concentrations', only 3 concentrations, or gave 4 and a control with none. A control with no nitrate would be an irrelevant concentration in the context of finding out the optimum concentration for growth. In addition, only the better responses referenced the value provided in the question and gave figures around the 200ppm cited as being the optimum concentration of nitrate ions for Pelargonium growth.

When it comes to controlling variables, many gave vague references – 'keep other factors constant', or only gave one accepted factor, usually phrased as 'temperature' or 'sunlight'. Indeed many seemed to think that placing the plants on a windowsill is sufficient to explain experimental detail!

Many appreciated the need for a sensible length of time to be provided for the plants to grow, beyond a 'few days', although the times given did range from 10 minutes to 5 years!

There are many candidates who still refer to 'repeats for reliability' as a stock phrase with little understanding of the reasons. Only those who correctly referred to repeating the experiment at each concentration, or using the data from repeats to calculate means gained the mark.

6 Plants need mineral ions to ensure healthy growth.

*(a) The optimum concentration of nitrate ions for healthy growth of *Pelargonium* plants is thought to be about 200 parts per million.

Pelargonium

Magnification × 0.1

Describe how you would carry out an investigation to find the optimum concentration of nitrate ions needed for the healthy growth of *Pelargonium* plants in a laboratory.

(5)

3 different concentrations of Nitrate ions could be used. explants.

· ~~Then~~ 3 plants used (Pelargonium).

- Ensure they are taken from same plant and are the same age.
- The 3 different concentrations of nitrate ions are soaked on a paper disk. *Paper disk placed into nutrient agar plate using forceps.
- The 3 explants put into a seperate nutrient agar plates (Ensure all other minerals are controlled)
- The 3 explants each have a paper disk of different concentration in them.
- & The Agar plate is sealed and incubated.

The growth of the explants then measured.
The Rs length of the roots formed by each explant.

ResultsPlus
Examiner Comments

This gains three marks - one for explants all from the same plant, one for plants being the same age and one for measuring the length of roots.

No mark can be given for only referring to 3 different nitrate concentrations.

ResultsPlus
Examiner Tip

Add relevant details - incubated how?

How will 3 different concentrations enable anyone to determine the optimum concentration?

Reading the question reveals reference to an optimum 'thought to be about 200ppm' - use this information in your answer!

in a laboratory.

(5)

Place different concentrations of nitrate ions into 5 different pelargonium plants wich are of similar height. Use concentration of 100ppm, 200ppm, 300ppm, 400ppm, 500ppm. Measure the all plants height before nitrate concentrations are added. Leave the plants in a suitable environment where all the plants are kept at the same temprature and have the same exposure of light intensity. Water the plants everyday with the same volume of water from the same source. After one week record the heights of each plant and work out the range from which it has. grow for each plant. The largest range will indicate the best concentration. Repeat the expirment to make results reliable

ResultsPlus
Examiner Comments

This is a good example and gains full marks:

mp3 and 4 for 5 different nitrate concentrations, from 100- 500ppm;

mp5 - reference to controlled environmental conditions, temperature and light intensity being kept the same, as well as reference to providing same volume of water daily;

mp7 - plants left to grow for one week;

mp6 - heights of plants measured to assess growth.

ResultsPlus
Examiner Tip

Note - 'repeat the experiment to make the results reliable' is not credit worthy on its own - there should be reference to repeating at each concentration, or repeating in order to work out mean data.

Question 6 (b) (i)

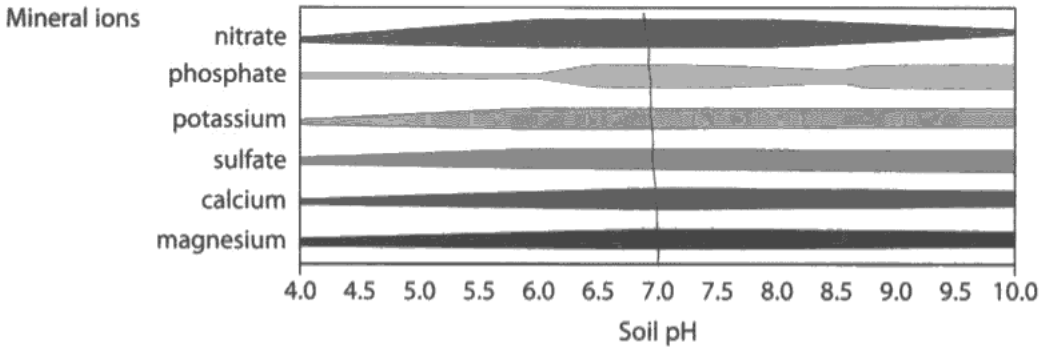
Very few candidates failed to choose a pH in the accepted range. However, a significant number did fail to express clearly that in this range the availability of minerals was at its highest but, instead, described the width of the bars on the graph, or referred to concentrations, showing that they had not read the question carefully.

A few candidates gave an inappropriate range and many suggested 'all the minerals are present', 'there are optimal mineral amounts', or simply referred to the width of the bars, not relating them to the availability.

(b) The availability of mineral ions to a plant is affected by the pH of the soil.

The chart below shows the effect of soil pH on the availability of mineral ions to plants.

The width of each bar indicates the availability of each mineral ion.



(i) Using the information from the chart, suggest the optimum soil pH for healthy growth of a plant. Give **one** reason for your answer.

(2)

7.0 PH, the availability of all of the mineral ions are greatest / most at this PH.

ResultsPlus
Examiner Comments

Full marks for a clear, well worded response. One for a sensible pH of 7.0 suggested and one for stating clearly that the availability of all mineral ions is greatest.

ResultsPlus
Examiner Tip

Check graphs, tables and other forms of data to make sure you know what they're showing - the information in the question here explains that the widths of the bars indicate the availability of the mineral ions. Many referred to concentrations - which are not shown or described in this question.

(b) The availability of mineral ions to a plant is affected by the pH of the soil.

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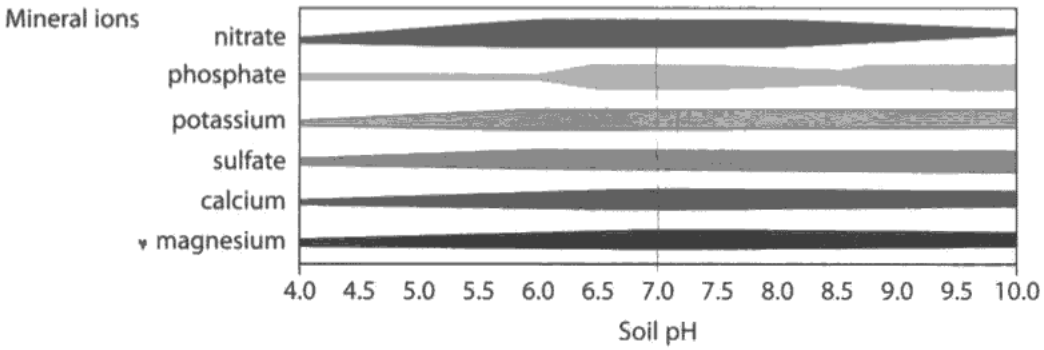


(i) Using the information from the chart, suggest the optimum soil pH for healthy growth of a plant. Give **one** reason for your answer.

(2)

The optimum pH would be 7 the nitrate availability is the greatest. Nitrates are needed in order for a plant to grow as it produces DNA and proteins which enable the plant to grow.

ResultsPlus
Examiner Comments

2 marks for pH 7 and maximum availability of nitrate.

Question 6 (b) (ii)

This was well answered by the majority, with most referring to magnesium and its function in chlorophyll production, although quite a few said that it was needed for the production of chloroplasts. Fewer referred to nitrate, and phosphate, and a handful to calcium. A few weaker candidates gave vague references to 'less photosynthesis'. Most candidates gained 2 marks although some candidates just said that without a specific mineral, they wouldn't be able to photosynthesise rather than linking it to a specific issue.

The mark scheme here allowed for responses from A2 candidates re-sitting this paper who would be aware of the need for phosphate for the light dependent and light independent stages of photosynthesis, although AS candidates would not be expected to know that level of detail, as phosphate is not named as a mineral whose role has to be known in the AS specification.

Quite a few said that low pH would stop enzymes from working, which, despite being technically correct, does not answer the question which was phrased 'Using information from the chart'.

(ii) Using information from the chart, explain why a low soil pH could result in reduced photosynthetic activity by plants.

(2)

At low soil pH, availability of phosphate and magnesium are at its lowest, both of which are needed for photosynthesis. Reduced magnesium leads to a reduction of chlorophyll production and is also needed to activate some enzymes. phosphate ions are needed for ATP production which is also needed during photosynthesis

ResultsPlus

Examiner Comments

A good response, clearly referring to data in the chart showing lack of magnesium and phosphate, then discussing the roles of these minerals in photosynthesis.

Note - this would have gained full marks even without reference to phosphate ions.

$CO_2 + H_2O \rightarrow glucose + O_2$.

(ii) Using information from the chart, explain why a low soil pH could result in reduced photosynthetic activity by plants.

(2)

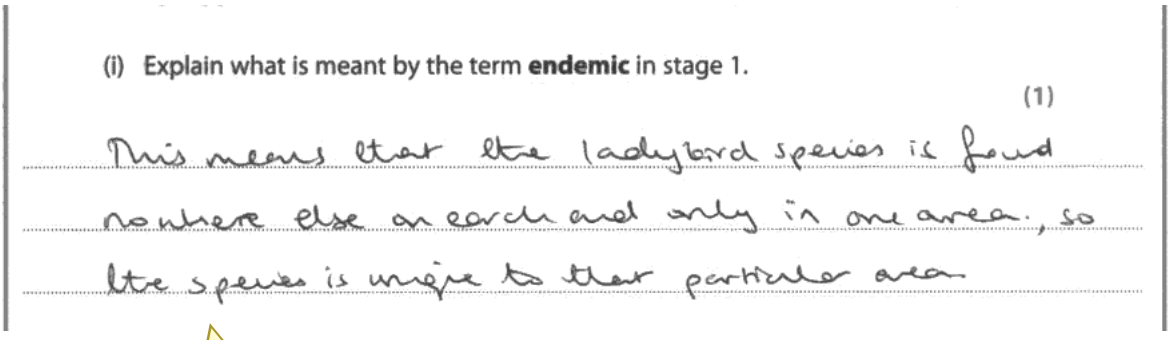
When soil pH is low, all the mineral ions are not available. This results in slow growth and pale yellow leaves due to lack of magnesium. Chlorophyll cannot ~~be~~ absorb light energy because there no chlorophyll in leaves. Chlorophyll is green pigment in thylakoid membranes.

ResultsPlus
Examiner Comments

No mark can be given for stating that at low soil pH 'all mineral ions are not available' as this is an incorrect statement. They are available, but less so than at higher pH values.Although both magnesium and chlorophyll are mentioned there is no indication that the candidate knows that magnesium is required for the synthesis of chlorophyll.

Question 7 (b) (i)

It appeared that many candidates lack confidence in using appropriate biological terminology. Habitat and environment being used interchangeably with location. There were a lot of answers talking about endemic meaning rare, or referring to genes. It did appear that candidates either understood the phrase well or had no idea what it meant.



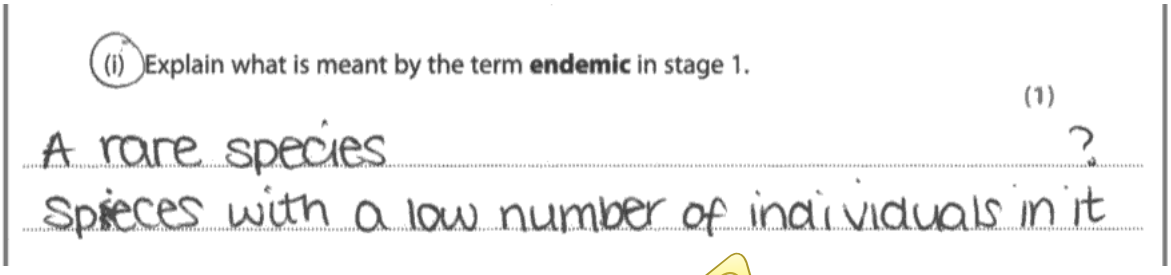
(i) Explain what is meant by the term **endemic** in stage 1.

(1)

This means that the ladybird species is found nowhere else on earth and only in one area, so the species is unique to their particular area

ResultsPlus
Examiner Comments

Correct statement that species found 'nowhere else on earth' and 'only in one area' and 'unique to their particular area' - three different ways of phrasing the correct response.



(i) Explain what is meant by the term **endemic** in stage 1.

(1)

A rare species ?

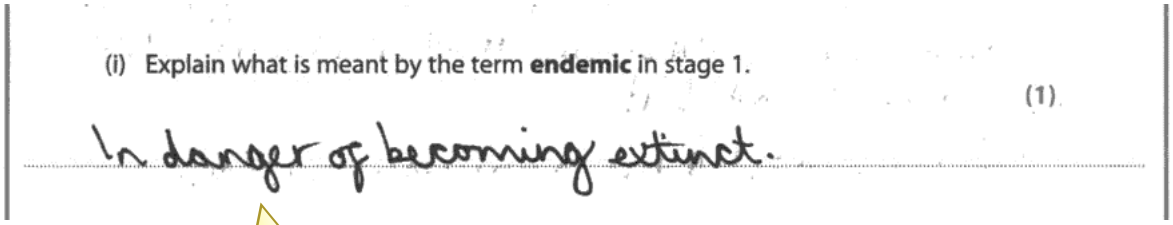
Species with a low number of individuals in it

ResultsPlus
Examiner Comments

It is clear that this candidate is confused by the term 'endemic' and has made a guess at its meaning. This did not score the mark.

ResultsPlus
Examiner Tip

There are key phrases and terms in the specification - make sure you know what they mean.



(i) Explain what is meant by the term **endemic** in stage 1.

(1)

In danger of becoming extinct.

ResultsPlus
Examiner Comments

A common misconception of the term 'endemic' - many candidates assumed that if a species was only found in one place, it must be endangered and decided that must be the meaning of endemic.

Question 7 (b) (ii)

This was generally poorly answered, only 20% of candidates achieved full marks – often due to poor, imprecise language. Only about a quarter of candidates referred to meiosis correctly and many of these failed to refer to crossing over and random assortment in context. It did appear that many had learnt the phrases 'crossing over' and 'random assortment' without understanding the actual processes. Many candidates gained a mark for 'mutation', but an alarming number thought that organisms deliberately mutate themselves to evolve. A few even mentioned different species mating.

As a consequence of disregarding the context of the question (referring candidates to Stage 1 in the flow chart provided), many thought this question was about the process involved when organisms adapt to environmental change and then referred to allele frequencies, natural selection and evolution.

(ii) Suggest how genetic variation occurs within a population of ladybird beetles in stage 1.

(3)

during meiosis, there's crossing over and independant assortment where genes cross over ~~the~~ on the chromosomes, so swapping genetic material (crossing over), independant assortment is when homologus pairs line up and swap & ~~those~~ mate selection where ~~they~~ different beetles reproduce, producing different offspring each time.

ResultsPlus
Examiner Comments

This candidate has shown that they have recalled a number of processes involved in the creation of genetic variation, yet fail to score full marks due to lack of specific details.

They achieved one mark for 'meiosis' and one for the idea of random mate selection.

Although both crossing over and independent assortment are given as answers, reference to 'genes' crossing over and 'homologous pairs' swapping is not accurate enough to gain those marks.

ResultsPlus
Examiner Tip

Be clear - crossing over involves the chromatids (when the homologous pairs of chromosomes line up) and independent assortment of chromosomes occurs during meiosis.

Don't just learn stock phrases without understanding what they actually mean.

(ii) Suggest how genetic variation occurs within a population of ladybird beetles in stage 1.

(3)

Mutation - ~~bases are~~ so the base sequences of DNA is altered during DNA replication, altering the gene coding for a protein.
Crossing over of homologous chromosomes leading to gen sections of DNA being swapped on chromosomes giving rise to a new combination of alleles. *Meiosis
Independent assortment of homologous chromosomes - the homologous chromosomes can mix and match to allow genetics to have much variation in genetic information.

*' occurs during Meiosis, as does independent assortment

ResultsPlus
Examiner Comments

This answer achieved full marks. Mutation is given as a cause of genetic variation and is explained. Crossing over is also explained as occurring between chromosomes and giving rise to new combinations of alleles.

Independent assortment of chromosomes is also explained.

One mark can also be given for reference to meiosis in the correct context.

Question 7 (b) (iii)

This question discriminated well, showing a full range of marks. There were many excellent answers with full descriptions of advantageous alleles and their selection – these answers used precise language. Other answers, however, were confused – candidates still struggle to distinguish between genes and alleles, and many still seem to believe in Lamarckian evolution whereby the ladybirds mutated themselves to camouflage in order to avoid predators. Many candidates also wrote about passing on the adaptation rather than the allele.

The concept of alleles giving rise to advantageous characteristics, which increase the chances of individuals surviving and breeding is a key principle to natural selection and is often poorly grasped.

(iii) Explain what could occur in stage 2 to bring about adaptation in the ladybird beetle population.

(4)

The advantageous allele has increased in the gene pool (allele frequency) which allows the ladybird beetles to survive and adapt better in their habitat. Genes from the orgiral species which are advantageous could be passed on to the next generation. Natural selection occurs.

ResultsPlus
Examiner Comments

This response seems to be written in the wrong order - starting with an increase in the frequency of the advantageous allele in the gene pool. This is the only mark awarded.

No credit can be given for passing on the advantageous 'genes'.

If reworded to 'alleles ... which are advantageous could be passed on to the next generation' a mark could have been awarded.

Also reference to 'surviving and breeding' instead of 'survive and adapt' would also have been credit worthy.

ResultsPlus
Examiner Tip

For longer answers, it is often worth jotting down a few short notes to help you write a well structured response.

Take care to use the correct terms - know the difference between genes and alleles. Alleles are different forms of a gene.

The key is adaptations that allow individuals to 'survive and breed' in order to pass on advantageous alleles.

(iii) Explain what could occur in stage 2 to bring about adaptation in the ladybird beetle population.

(4)

Some individuals have alleles that are advantageous for different environments. If the environmental conditions changed there would be different selection pressures acting on the alleles. individuals with the advantageous alleles would survive and reproduce passing on their alleles, leading to adaptations.

ResultsPlus

Examiner Comments

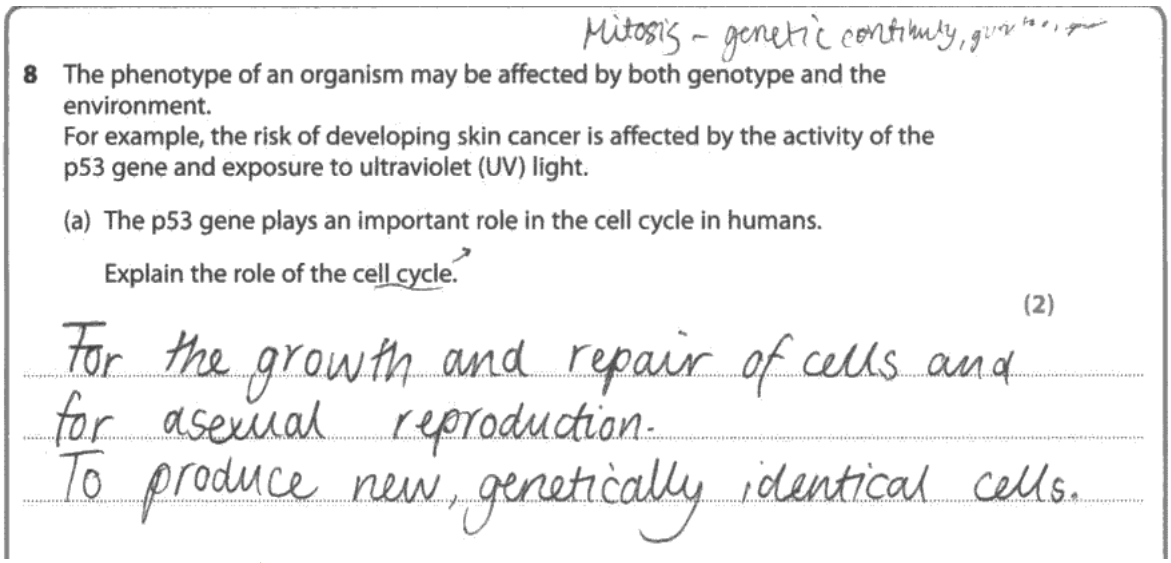
A good, clear response - this candidate understands the role of advantageous alleles and correctly refers to them enhancing the survival chances of individuals should the environment change. There is also reference to these individuals surviving to reproduce and pass on these alleles.

This response gained full marks.

Question 8 (a)

This question should have been accessible to most candidates but many weaker responses referred to cell growth and cell repair rather than tissue growth and repair. Strong candidates often gained both marks. Some candidates mixed this up with meiosis and some simply restated the information in the text about p53.

Good responses referred to the role of the cell cycle in providing new cells to replace old/ damaged cells and repairing tissues.



Mitosis - genetic continuity, g...

8 The phenotype of an organism may be affected by both genotype and the environment.
For example, the risk of developing skin cancer is affected by the activity of the p53 gene and exposure to ultraviolet (UV) light.

(a) The p53 gene plays an important role in the cell cycle in humans.

Explain the role of the cell cycle.

(2)

For the growth and repair of cells and for asexual reproduction.
To produce new, genetically identical cells.

ResultsPlus
Examiner Comments

This response gains one mark for reference to asexual reproduction and the production of genetically identical cells (either of which would have gained the same mark).

If the phrase 'growth and repair' had been qualified as 'growth of the organism and repair of tissues', full marks would have been awarded.

8 The phenotype of an organism may be affected by both genotype and the environment.
For example, the risk of developing skin cancer is affected by the activity of the p53 gene and exposure to ultraviolet (UV) light.

(a) The p53 gene plays an important role in the cell cycle in humans.

Explain the role of the cell cycle.

(2)

The cell cycle is needed for asexual reproduction (reproduction of cells), and for ~~tissues~~/ the repair (/replacement) of ~~dea~~ dying/damaged cells and tissues.

ResultsPlus
Examiner Comments

One mark was awarded for asexual reproduction.One for was also given for either repair of the damaged tissues or replacement of damaged cells - even though the candidate appeared to have been trying all combinations!

8 The phenotype of an organism may be affected by both genotype and the environment.
For example, the risk of developing skin cancer is affected by the activity of the p53 gene and exposure to ultraviolet (UV) light.

(a) The p53 gene plays an important role in the cell cycle in humans.

Explain the role of the cell cycle.

(2)

The cell cycle allows for cells to multiply so that organism can grow, replace damaged tissues and reproduce asexualy.

ResultsPlus
Examiner Comments

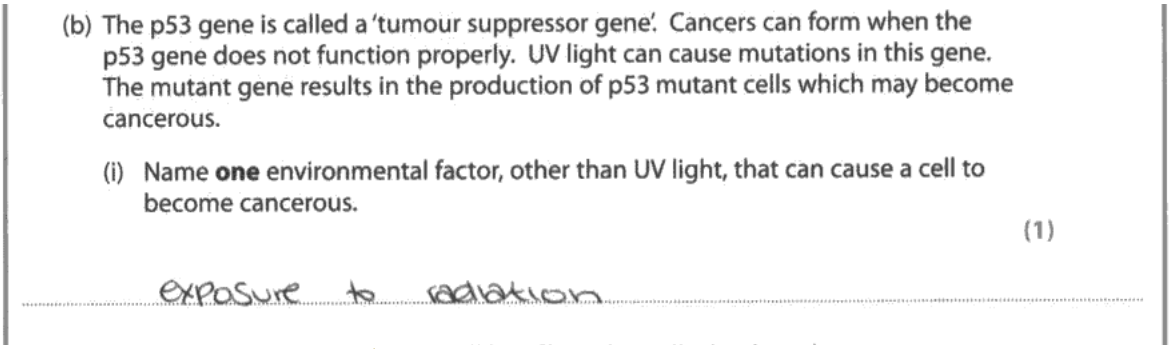
This is a clearer response - gaining one mark for 'allows cells to multiply' (could also have been given for growth of organism), and one for replacing damaged tissues. There is also a mark that could have been given for reference to asexual reproduction.

A very good answer.

Question 8 (b) (i)

The responses to this question indicated two trends – the first being an obvious failure to read the question, as made clear by the number giving UV light or sunlight as an answer, despite a clear instruction to provide an example other than UV. Others read the reference to 'environmental factor' and provided answers relating to abiotic factors, including temperature, weather and, even, altitude.

Also evident is the lack of understanding of what factors do give rise to cancer – anything from carbon monoxide to infra red and just plain radiation, without any qualification of the form of radiation provided. At this level, candidates are expected to know that radiation alone cannot cause cancer, it has to be a specific form of radiation.



(b) The p53 gene is called a 'tumour suppressor gene'. Cancers can form when the p53 gene does not function properly. UV light can cause mutations in this gene. The mutant gene results in the production of p53 mutant cells which may become cancerous.

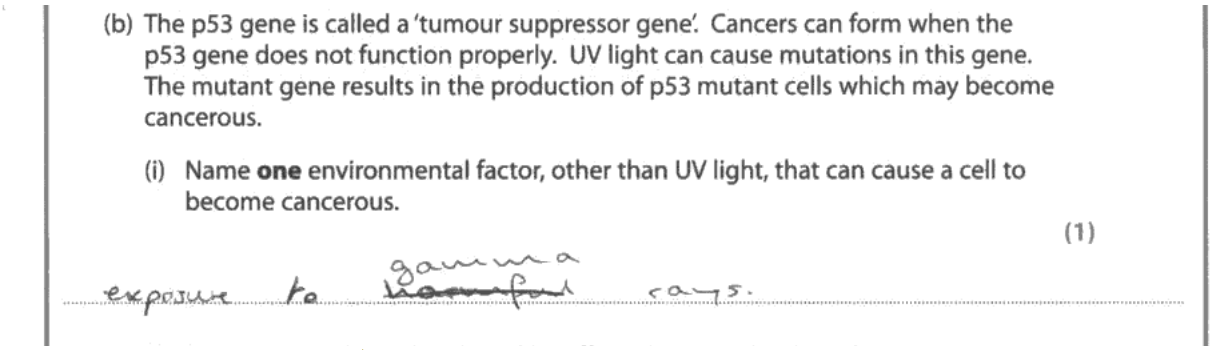
(i) Name **one** environmental factor, other than UV light, that can cause a cell to become cancerous.

(1)

exposure to radiation

ResultsPlus
Examiner Comments

This is too vague to gain a mark - radiation is a form of heat transfer.



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(i) Name **one** environmental factor, other than UV light, that can cause a cell to become cancerous.

(1)

exposure to gamma rays.

ResultsPlus
Examiner Comments

Good qualification of the type of radiation that does give rise to cancer - 'gamma rays'.

ResultsPlus
Examiner Tip

If this candidate had not checked their answer and altered it to make it more specific, they would not have gained a mark for 'harmful rays'.

Always check your answers - if they look vague, they are not going to gain full marks.

(b) The p53 gene is called a 'tumour suppressor gene'. Cancers can form when the p53 gene does not function properly. UV light can cause mutations in this gene. The mutant gene results in the production of p53 mutant cells which may become cancerous.

(i) Name **one** environmental factor, other than UV light, that can cause a cell to become cancerous.

(1)

- lifestyle - whether it is healthy or not. cytokinases
- Protection from UV light. Eg wearing sun-cream or not

ResultsPlus
Examiner Comments

The phrase 'lifestyle - whether it is healthy or not' is obviously far too vague to gain credit. The next part of the response stating 'protection from UV light, e.g. wearing sun-cream or not' shows that this candidate has failed to read the instructions to name an environmental factor other than UV light.

ResultsPlus
Examiner Tip

Read all parts of the question with care - do not skim read the instructions or you will miss vital details.

(b) The p53 gene is called a 'tumour suppressor gene'. Cancers can form when the p53 gene does not function properly. UV light can cause mutations in this gene. The mutant gene results in the production of p53 mutant cells which may become cancerous.

(i) Name **one** environmental factor, other than UV light, that can cause a cell to become cancerous.

(1)

Carcinogens such as Tar from cigarettes

ResultsPlus
Examiner Comments

Although 'smoking' was accepted as an answer, it is preferable to produce an answer like this one, making it clear that cigarette smoking causes cancer because of the carcinogenic chemicals in the tar.

ResultsPlus
Examiner Tip

Be clear and add vital details if you know them.

Question 8 (b) (ii)

This was found to be demanding by most candidates, with only 10% of candidates achieving full marks. Where candidates gained credit, it was typically for the idea of uncontrolled division. Candidates often hinted at the idea of the cycle occurring at a more rapid rate, but often phrased it in the context that growth or mitosis would be faster. Many thought that interphase would disappear completely, and in some cases implied that DNA replication would never occur. Few gained both marks. Most candidates only gained one mark for reference to cell division happening out of control, with a few referring to the Hayflick limit.

Many could have achieved better marks if they had read the question with more care, there were many responses referring to the effects on cell division, instead of the cell cycle.

(ii) Suggest how the cell cycle will be affected in cells that have become cancerous.

(2)

In a cancerous cell, the cycle does not stop and continues. Also, the cells are no longer programmed to die and so ~~the~~ the tumour does not stop growing. Genes that stop the cell cycle, such as p53, can no longer halt the cell cycle during interphase and the cycle continues.

ResultsPlus
Examiner Comments

This response gains one mark for reference to lack of 'stops' on the cell cycle.

(ii) Suggest how the cell cycle will be affected in cells that have become cancerous.

(2)

the cell will divide rapidly and uncontrolably. There is nothing to ~~supress~~ supress the cells to stop dividing when they are not needed, so the cells carry on dividing with a very short interphase period (when the cell doesn't divide). The cell cycle will be ~~on~~ at prophase, metaphase, anaphase or telophase for more time.

ResultsPlus
Examiner Comments

This candidate has understood the concepts involved and has gained full marks. There is reference to uncontrolled cell division and lack of mechanisms to suppress cell division. One mark can also be given for 'very short interphase period' as well as reference to cells being at the varying stages of mitosis for more time.

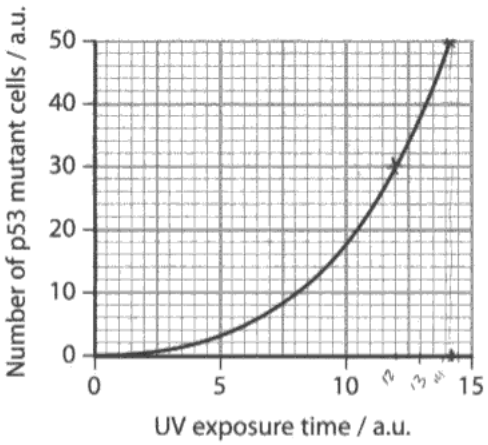
Question 8 (c) (i)

This was a straightforward question asking candidates to read a point off a graph. There was no manipulation of data required. However, many failed to get the mark as a result of not reading the scales correctly or drawing lines freehand.

The use of a ruler and a sharp pencil to draw parallel lines would vastly improve the frequency of correct responses to these types of question.

(c) In an investigation, isolated skin cells were exposed to UV light for different lengths of time. The number of p53 mutant cells produced was recorded.

The graph below shows the effect of UV light on the number of p53 mutant cells produced.



(i) Use the graph to find the number of p53 mutant cells produced after an exposure time of 12 a.u.

(1)

20 a.u.

ResultsPlus
Examiner Comments

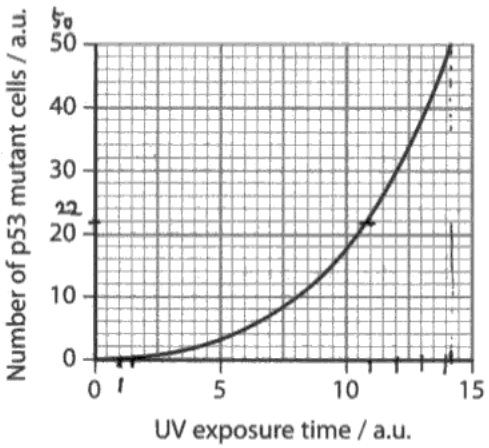
This candidate has drawn a cross where the lines intersect and has then written 20 instead of 30. Perhaps the act of drawing the line across to the correct point on the y axis would have prevented this error.

ResultsPlus
Examiner Tip

Draw the lines on the graph to make sure you're reading the correct point.

(c) In an investigation, isolated skin cells were exposed to UV light for different lengths of time. The number of p53 mutant cells produced was recorded.

The graph below shows the effect of UV light on the number of p53 mutant cells produced.



(i) Use the graph to find the number of p53 mutant cells produced after an exposure time of 12 a.u.

(1)

50 - 22 = 28 a.u

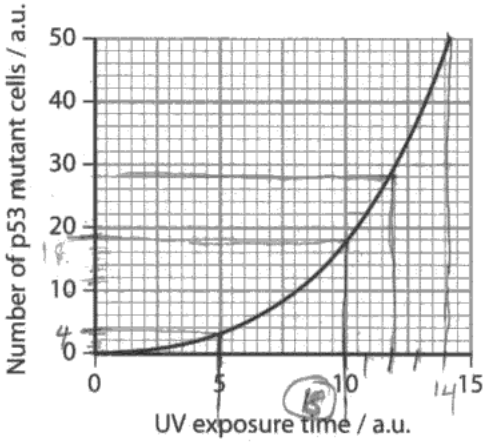
28 a.u.

ResultsPlus
Examiner Comments

For some reason this candidate has overcomplicated the task - they have marked off the scale on the x axis and then come up with the figures of 50 and 22. Subtraction has given them 28.

ResultsPlus
Examiner Tip

Practice reading points off graphs and working out the scales.



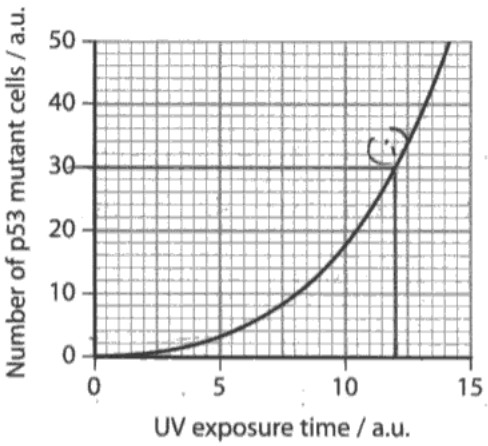
(i) Use the graph to find the number of p53 mutant cells produced after an exposure time of 12 a.u.

(1)

28 a.u.

ResultsPlus
Examiner Comments

Freehand drawing of lines on graphs is risky - as can be seen here. Always use a ruler, preferably a transparent one (to keep lines parallel more easily), and a sharpened pencil for accuracy.



(i) Use the graph to find the number of p53 mutant cells produced after an exposure time of 12 a.u.

(1)

30 a.u.

ResultsPlus
Examiner Comments

This answer indicates that the use of a ruler helps the candidate read the point off the graph with ease to gain the mark.

Question 8 (c) (ii)

Well prepared candidates fared well with this question, two thirds of candidates achieving at least 2 marks, generally for a full description of the graph. Most were able to identify, or at least describe, the positive correlation, but fewer candidates noticed that the relationship was not linear. Although many described the shape of the graph, few used the terms exponential or non linear. Many candidates did not manipulate data, and only about 20% gave a numerical calculation, most simply quoting numbers from the graph. Those that did make an attempt at a calculation misread the graph and many referred to readings at 15au light intensity, even though the line finished before 15au, or the calculation was incorrect, especially where candidates had attempted to calculate a percentage increase.

(ii) Using the information in the graph, describe the effect of exposure to UV light on the number of p53 mutant cells produced.

(3)

The graph shows that as the UV light increases more mutant p53 cells are made/produced. It shows that the amount of mutant cells increase very quickly. After 5 minutes there are only around 5 a.u. mutant cells. but by 10 minutes there is 18 a.u. This shows the mutant cells has ~~has not doubled~~ has tripled in the space of five minutes. The graph shows the number of cells continue to increase rapidly.

ResultsPlus
Examiner Comments

One mark for positive correlation described - 'as UV light increases more mutant p53 cells are made'. No mark for manipulation of data - from 5 to 18 is not a tripling. Simply repeating data from the graph does not gain this mark.

(ii) Using the information in the graph, describe the effect of exposure to UV light on the number of p53 mutant cells produced.

(3)

as UV exposure time increases, number of p53 mutant cells increases. The increase is gradual until around exposure time of 5 a.u after which the increase is much more rapid. For example, the difference in number of p53 mutant cells between exposure times 7.5 a.u and 12 a.u was 22 a.u

ResultsPlus
Examiner Comments

This gained full marks. First of all there is a description of a positive correlation, then a description of the non-linear nature of the relationship. Finally, for the third mark, there is a correct calculation of the difference in number of p53 mutant cells between two different exposure times.

ResultsPlus
Examiner Tip

Don't try to over complicate the manipulation of data - go for something easy to calculate initially, such as the difference between two separate points on the graph - but do take care with scales on the axes.

Question 8 (c) (iii)

This question simply asked candidates to name the type of cell division responsible for the increase in number of p53 mutant cells. Despite earlier parts of Q8 prompting candidates to describe the function of the cell cycle, there were still a few that got this wrong. However, over 90% of responses were correct.

A common mistake was misspelling mitosis so that it was midway between mitosis and meiosis.

(iii) Name the type of cell division responsible for the increase in number of the p53 mutant cells.

(1)

~~Nuclear~~ Nuclear division .

ResultsPlus
Examiner Comments

Careless mistake from not reading the question - a type of cell division is not going to be nuclear division.

(iii) Name the type of cell division responsible for the increase in number of the p53 mutant cells.

(1)

miosis.

ResultsPlus
Examiner Comments

Hybrid words that are neither mitosis or meiosis will not gain credit. All that stood in the way of this candidate gaining the mark was the letter 't'!

(iii) Name the type of cell division responsible for the increase in number of the p53 mutant cells.

(1)

~~Mitosis~~ Meiosis .

ResultsPlus
Examiner Comments

It is very common to see examples like this, of candidates crossing out a correct answer and replacing it with one which is incorrect.

If in doubt, think first, before crossing out what's been written. Usually, instincts are correct and the answer is right the first time.

ResultsPlus
Examiner Tip

Always check before crossing out an answer and replacing it!

Question 8 (d)

This question drew some excellent, well written answers, with over 50% of candidates achieving full marks. Where candidates understood the question, they often gained full credit, although almost 20% scored nothing. Many were imprecise in the usage of the term transcription (the mRNA was often transcribing the gene, or even translating it) but were often able to gain three other mark points. As usual there was some confusion between the terms transcription and translation. A few did not fully understand the question and simply discussed cell division and cell differentiation in the embryo. Others wrote about totipotency and pluripotency, and some described the function of specialised cells e.g. goblet cells. There were even a few descriptions of the stages of mitosis.

(d) When cells divide out of control to produce a tumour, the cells may not become specialised.

Describe the process by which cells usually become specialised following cell division.

(3)

The cell is stimulated usually by a chemical. The genes that are activated are transcribed to make mRNA. The genes that aren't activated aren't transcribed. The mRNA moves goes to a ribosome in the cell cytoplasm to be translated, producing a protein. Proteins that are produced alter the structure a function of the cell- sometimes permently- becoming specialised.

(Total for Question 8 = 13 marks)

ResultsPlus
Examiner Comments

This is an excellent example of a response that covers virtually every marking point.

Chemical stimulus of the cell, activation of genes, transcription of activated gene, translation of mRNA and production of a protein that can permanently affect the structure and function of the cell.

A perfect answer.

ResultsPlus
Examiner Tip

Think of the sequence of events involved and write your answer in that order, with a beginning, a middle and an end.

(d) When cells divide out of control to produce a tumour, the cells may not become specialised.

Describe the process by which cells usually become specialised following cell division.

(3)

The Gene expression will happen allowing some genes to be active, whilst others are inactive. The cells will then do what has been asked of them, creating certain proteins for specific jobs. The cell will then become specialised for its ~~per~~ specific job.

ResultsPlus
Examiner Comments

This shows the type of response that is along the right lines, but too vague to gain full marks.

This is just enough to gain credit for reference to activation of genes leading to production of proteins for 2 marks.

The phrase 'the cells will then do what is asked of them' suggests a conscious decision on the part of the cells!

ResultsPlus
Examiner Tip

Try to be specific, relevant and detailed in your responses.

(d) When cells divide out of control to produce a tumour, the cells may not become specialised.

Describe the process by which cells usually become specialised following cell division.

(3)

All cells start out as totipotent, meaning they can specialise into any sort of cell but as they are transported to different areas of the body, finding different functions, they can become pluripotent.

ResultsPlus

Examiner Comments

This is an example of a response referring to totipotency and pluripotency.

Many made the mistake of referring to these processes, rather than describe how the cells become specialised. This response gained no marks.

Paper Summary

In order to improve their performance candidates are offered the following advice:

- read all of the details in the questions carefully, paying careful attention to instructions, especially when asked to use information in the 'graph/table'
- develop a familiarity with the terminology encountered at this level and understand what the phrases mean
- review all of the recommended core practicals with particular reference to laboratory procedures
- gain practice at interpreting information presented graphically and in tables, including data manipulation
- practice hand writing responses to questions to develop better skills at expressing themselves.

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