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Examiners' Report
June 2014

IAL Biology WBI02 01

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Introduction

Overall, many candidates demonstrated a relatively good standard of biological knowledge, but the standard of communication often let them down. Poor spelling, punctuation and grammar led to many marks being lost. Apparent inability to read questions carefully and to actually use the information presented on the question paper cost many candidates vital marks.

There was evidence of a good understanding of the ultrastructure of the cell, with knowledge of the roles of the different organelles, especially in the process of cell differentiation. The role of meiosis was well understood by many candidates, although others struggled to explain how meiosis brings about genetic variation in gametes. The processes involved in the double fertilisation of flowering plants were understood well by most, although confusion between nucleus and nuclei is still evident. Natural selection was grasped by many, although not all were able to apply this to an unfamiliar context.

The recollection of core practicals and the application of skills that should have been learnt through carrying out these procedures was variable, yet again suggesting that not all candidates have had the opportunity to fulfil this aspect of the specification.

Many candidates interpreted data from tables and graphs effectively, remembering to use appropriate units and realising that manipulation of data to support statements will gain extra marks. However, there were examples where candidates had misread graphs, or failed to select appropriate data to support their answers.

There were also many occasions when candidates were unable to articulate their answer in a way that correctly answered the question. This is something that can be addressed by centres, especially through encouraging correct use of key vocabulary and practising exam technique. Learning mark schemes is not always the best preparation - it is better to use mark schemes and examiners' reports to help candidates understand how to answer questions.

Question 1 (b)

Although most candidates knew that genetic variation is brought about by the processes of independent assortment and crossing over, fewer were able to explain how this happens. The majority gained 2 marks for referring to these two processes.

Many attempts to explain crossing over failed as a consequence of referring to the crossing over of chromosomes instead of chromatids. There were also many vague references to the exchange of 'genetic material' rather than DNA or alleles. Some times candidates described chiasmata in relation to sister chromatids, rather than non-sister chromatids.

Few candidates successfully described independent assortment as they often failed to mention the role of paternal and maternal chromosomes. There were also mistakes made when referring to new combinations of genes instead of alleles.

Several candidates tried to obtain marks by referring to the random nature of fertilisation and many mentioned the effect of mutations – although these processes do bring about genetic variation, they do not specifically give rise to variation in the gametes.

(b) Cells divide by meiosis to produce pollen inside the anthers of flowers.

Explain how meiosis causes genetic variation in the gametes.

(4)

Meiosis is cell division without gametes. It causes genetic variation because the daughter cells are haploid, which means that they have half of the chromosomes.

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Examiner Comments

This response gained no marks. The production of haploid cells does **not** generate genetic variation. It is a function of meiosis, but it does not produce genetic variation in the gametes produced.

Meiosis ~~provides~~ causes genetic variation by random assortment giving different gene. Meiosis also causes the crossing over of genes causing traits to be exchanged and giving genetic variation. meiosis provide non identical cells

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Examiner Comments

This response gained two marks for mentioning both random assortment and crossing over. No more marks can be given as there is no indication that these processes have been understood by the candidate.

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Examiner Tip

Make sure the processes involved in meiosis are understood - just how do crossing over (of non-sister chromatids) and random assortment (of maternal and paternal chromosomes) give rise to new combinations of alleles?

Meiosis is cell division without gametes. It causes genetic variation because the daughter cells are haploid, which means that they have half of the chromosomes.

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Examiner Comments

A good response - this gained three marks. One mark for referring to 'crossing over' and one for describing the consequence - 'different combination of alleles'.

The third mark is given for describing random assortment as the 'chromosomes are arranged randomly'.

Re-shuffling of alleles between the non-sister chromatids is not quite precise enough for a mark - there must be an indication that alleles are exchanged between the non-sister chromatids.

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Examiner Tip

Remember - crossing over occurs between the (non-sister) chromatids and the chromosomes are randomly assorted - not the genes.

Question 1 (c)

It appeared that there was a significant proportion of candidates unfamiliar with the process of double fertilisation.

Generally there was some confusion about the names of the nuclei, with the generative nuclei frequently being referred to as the nuclei which then goes on to fuse with the female nucleus.

There were also many incorrect references to a nucleus fusing with 'polar bodies' instead of polar nuclei. It is disappointing to note that many seemed unaware that **nuclei** is the plural for **nucleus**, with many using the two words interchangeably.

(c) Describe the process of double fertilisation in flowering plants.

(2)

One generative nuclei fuses with egg cell forming zygote and the other generative nuclei fuses with two polar bodies forming endosperm nucleus which is triploid (3n).

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Examiner Comments

This gained no marks.

It is not the generative nucleus that brings about fertilisation, but the two male gamete nuclei produced when the generative nucleus divides.

The nuclei in the embryo sac that give rise to the endosperm are **polar nuclei**, not **polar bodies**.

The male nucleus fertilises the female nucleus to be able to form the seed. The other nucleus joins with two other nucleus inside the egg forming the endosperm.

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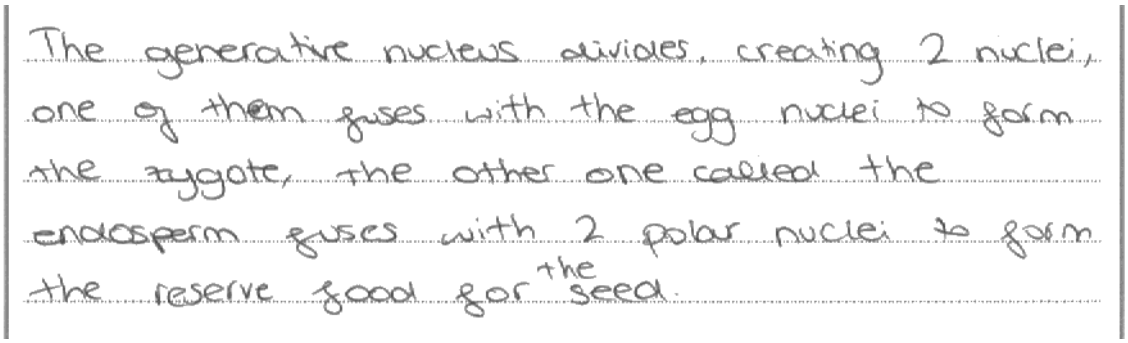
Examiner Comments

One mark was given for the male nucleus fertilising the female nucleus.

No mark for 'the other nucleus joins with the other two nucleus' inside the egg - the context is incorrect and the answer lacks clarity.


The generative nucleus divides, creating 2 nuclei, one of them fuses with the egg nuclei to form the zygote, the other one called the endosperm fuses with 2 polar nuclei to form the reserve food for the seed.

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Examiner Comments

Although this does not refer to male nuclei or male gamete nuclei, the marks were given as the nuclei were described as originating from the division of the generative nucleus.

Note reference to the 'egg nuclei' - this was ignored as the candidate did appear to understand the question.

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Examiner Tip

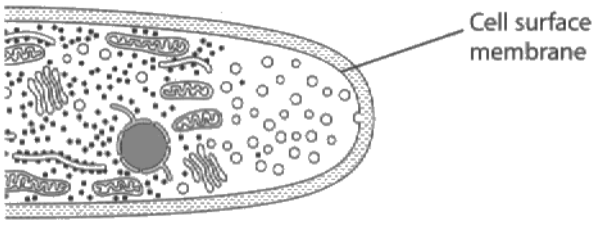
Nucleus - a single nucleus

Nuclei - more than one nucleus

Question 2 (b)(i)

The majority of candidates were able to get one mark for a reference to a membrane bound organelle but surprisingly few gained a second mark. Indeed most candidates knew that eukaryotes have membrane bound organelles and could produce a list of named organelles. Most candidates failed to say that the DNA is enclosed in the nucleus in eukaryotic cells, they thought it would be implied by writing that eukaryotes have a true nucleus. Some candidates did refer to the difference in ribosome size and others mentioned the difference in the form of DNA, i.e. circular in prokaryotes and linear in eukaryotes.

(b) The diagram below shows the growing tip of a fungus. This is called a hypha.



(i) Using information in the diagram and your own knowledge, explain why Fungi are classified as belonging to the Eukaryota and not the Bacteria.

(2)

They have a nucleus

They have mitochandrion

Both are characteristics of the eukaryota domain

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Examiner Comments

One mark could have been given for referring to either 'nucleus' or 'mitochondrion'.

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Examiner Tip

Remember that membrane-bound organelles are not the only feature that distinguishes between prokaryote and eukaryote cells.

They are ~~Eukaryotes~~ Eukaryota because they contain membrane-bound organelles (including a nucleus) and linear DNA (chromosomes) while Bacteria do not.

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Examiner Comments

A typical correct answer describing the presence of membrane bound organelles and naming the nucleus as an example.

However, a second mark could not be given for stating that fungi have 'linear DNA while bacteria do not'. Reference to the circular DNA of bacteria would have gained this mark.

They contain a nucleus which holds the DNA and the genetic information, where bacteria has it's genetic information as loops of DNA. They also contain golgi apparatus, which Bacteria doesn't contain.

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Examiner Comments

A good answer considering the location of the DNA in the two types of cell as well as the presence of organelles such as the Golgi apparatus.

Gained 2/2.

Question 2 (b)(ii)

Many candidates had a good overall grasp of the roles of the rER and Golgi apparatus in the processing and packaging of proteins in the cell and many scored high marks for this question. Most understood that the protein is folded whilst moving along inside the rER and modified in the Golgi apparatus, they also understood that the enzymes are secreted via exocytosis.

However it is the role of the vesicles which is either misunderstood or poorly expressed, some answers seemed to imply that the proteins became vesicles and not that they were enclosed in vesicles. It must be made clear that the phrase 'as vesicles' has a different meaning to 'in vesicles'.

The word **vesicle** was the most commonly misspelt and this did contribute to marks lost on QWC (Quality of Written Communications). Misspellings included 'vessicle' and 'vescicle'.

Better answers differentiated between transport (or shuttle) vesicles transferring the enzyme from the rER to the Golgi apparatus and secretory vesicles transporting the enzyme from the Golgi apparatus to the cell surface membrane. Another common mistake was to refer to lysosomes – these contain enzymes for action within the cell, whereas the question specifically referred to the **secretion of these enzymes**.

*(ii) Fungi feed by secreting digestive enzymes, which are synthesised at ribosomes.

Suggest how the structures shown in the diagram are involved in the processing and secretion of these enzymes.

(5)

Amino acids from DNA, are transgerd by mRNA to the rER were ribosomes are attached to, there the protein is formed. Proteins are packaged and procesed in the rER, for further processing protcins move by exocytosis forming vesicles to Golgi apparatus and enter the Golgi apparatus by endocytosis there proteins are folded into 3D shapes, tertiary structure to create the enzyme. Then by the process of exocytosis, they leave the Golgi apparatus with vesicles and are secreted out by exaccytosis

ResultsPlus
Examiner Comments

This response is an example of a candidate using many key phrases linked to the processes involved in the packaging and processing of proteins, but not using these in the correct context and subsequently not achieving any marks.

e.g. 'proteins move by exocytosis forming vesicles to Golgi apparatus'. The term exocytosis is used **four** times in this response - but incorrectly each time.

It is not clear that the enzymes are being packaged in vesicles or modified in the Golgi apparatus.

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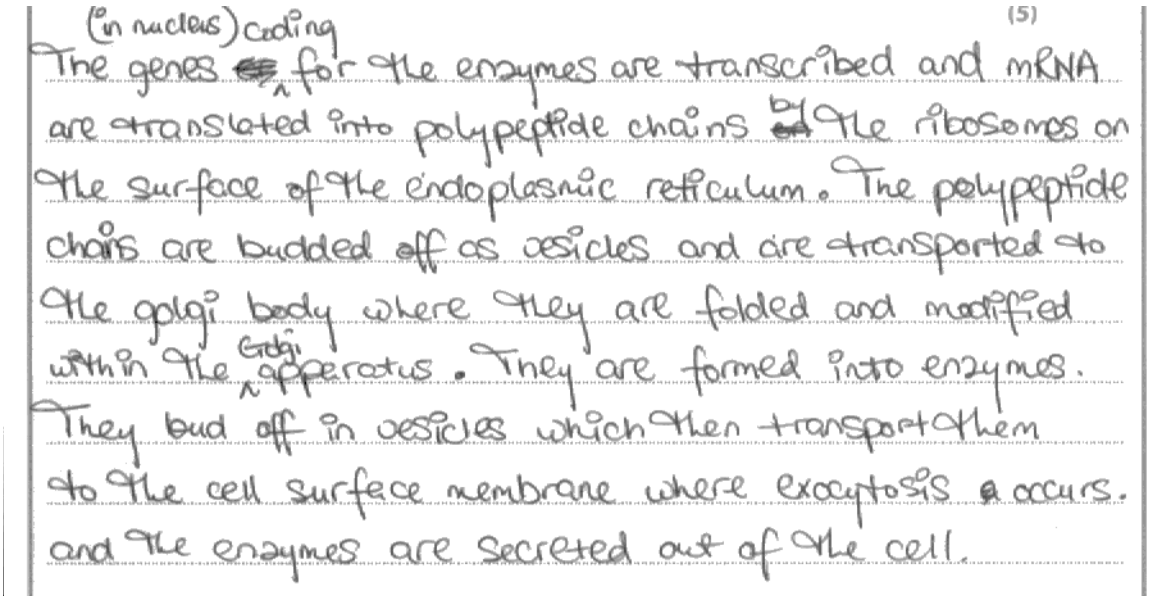
Examiner Tip

Learn what the key processes involve - e.g. **exocytosis** involves the fusing of vesicles with the cell surface membrane for the secretion of substances, such as enzymes, from cells.

QWC questions - indicated by the * - must be answered clearly to be awarded marks.



(in nucleus) coding (5)
The genes for the enzymes are transcribed and mRNA are translated into polypeptide chains by the ribosomes on the surface of the endoplasmic reticulum. The polypeptide chains are budded off as vesicles and are transported to the golgi body where they are folded and modified within the Golgi apperatus. They are formed into enzymes. They bud off in vesicles which then transport them to the cell surface membrane where exocytosis occurs. and the enzymes are secreted out of the cell.

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Examiner Comments

This is an example of poor description of vesicles.

e.g. 'polypeptide chains are budded off as vesicles' - this would be better phrased as ' vesicles are budded off containing the polypeptide chains'.

Vesicles bud off from the rER, fuse to form the Golgi apparatus and then bud off to transport the proteins out of the cell.

(3)

The hypha shown has RER which transports the proteins (enzymes) formed on its ribosomes. Then, they pinch off as they reach the last cisternae in a shuttle vesicle towards the golgi body. The proteins are packed, processed and modified while moving through the curved cisternae of the golgi body upwards. After that they pinch off the last cisterna in a secretory vesicle, that moves towards the cell membrane to be secreted outside the cell by exocytosis.

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Examiner Comments

Another example of lack of precision in wording. The proteins do not become pinched off - the vesicles are pinched off the rER and the Golgi apparatus, and they contain the protein.

This is a shame when other, quite technical, phrases such as 'shuttle vesicles' and 'cisternae' are used in an otherwise very good answer.

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Examiner Tip

Try not to use words like 'they' or 'it' - make it clear what you are referring to -

e.g. instead of 'they pinch off in a secretory vesicle... to be secreted' write ' the enzymes are packaged in vesicles that pinch off the Golgi apparatus... which fuse with the cell surface membrane to secrete the enzymes by exocytosis'.

Question 2 (b)(iii)

This question on cellulose structure was well answered, with many candidates showing a good understanding of the molecular structure of cellulose, with correct references to both β-glucose and 1,4- glycosidic bonds. There were also many answers that contained correct details concerning hydrogen bonds holding together adjacent cellulose molecules to form microfibrils, although a few did incorrectly refer to hydrogen bonds between the individual β-glucose monomers in the chain rather than between chains.

(iii) Some of the enzymes produced by fungi can digest the cellulose in plant cell walls.

Describe the structure of cellulose in plant cell walls.

(3)

Cellulose in plant cell walls is made up of a long chain of β glucose joined by condensation reaction. The bonds that formed are called ~~glycosidic~~ hydrogen

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Examiner Comments

This response gains just one mark for correctly describing cellulose as being made of β-glucose.

Even if this candidate had not crossed out 'glycosidic' they would not have gained the mark - it was necessary to state that the bonds between the monomers were 1,4 - glycosidic bonds.

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Examiner Tip

Precision matters - learn that starch is made of α-glucose and cellulose from β-glucose.

Cellulose is made by β-glucose molecules joined together by 1-4 glycosidic bonds in condensation reactions. The glycosidic bonds are straight and so the cellulose chains are straight. Between 50 and 80 cellulose chains are linked together by hydrogen bonds which form strong threads called microfibrils.

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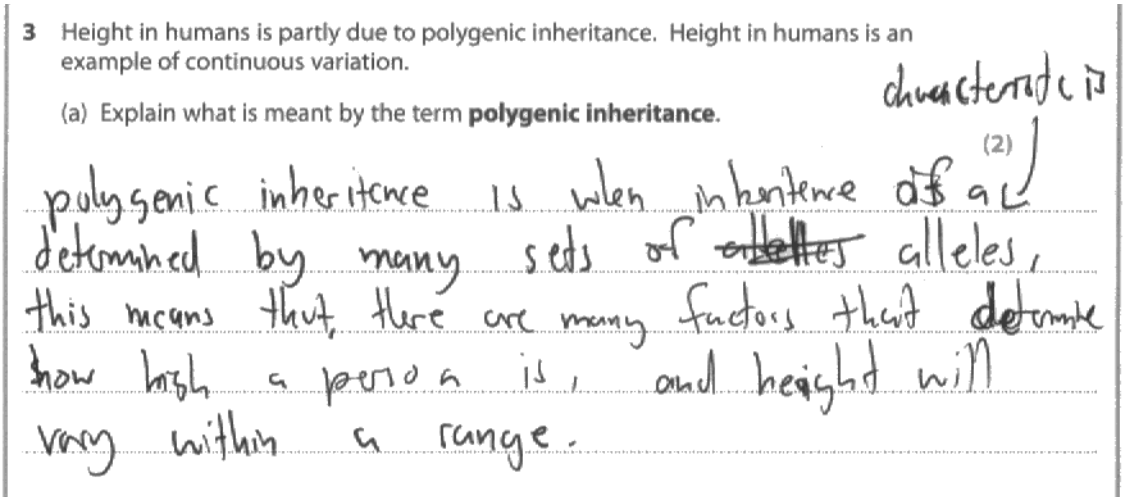
Examiner Comments

This is an excellent response covering all the main marking points, with precision.

Question 3 (a)

'Polygenic inheritance' is a concept that many candidates either do not understand or find difficult to put into words. Many candidates thought it refers to a characteristic that is affected by both genes and the environment and quite a few referred to several genes but then failed to relate this to a single characteristic.

The key to this concept is that polygenic inheritance refers to **a (single) characteristic** (not the phenotype generally) being determined by the cumulative effect of **more than one gene.** These genes are located at different loci.



3 Height in humans is partly due to polygenic inheritance. Height in humans is an example of continuous variation.

(a) Explain what is meant by the term **polygenic inheritance.**

(2)

polygenic inheritance is when inheritance of a characteristic is determined by many sets of ~~alleles~~ alleles, this means that there are many factors that determine how high a person is, and height will vary within a range.

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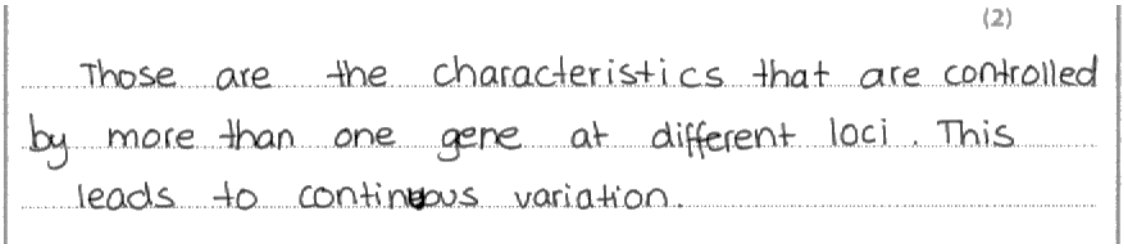
Examiner Comments

This is an example of a candidate who appears to understand what polygenic inheritance has failed to explain it clearly enough to gain a mark. Referring to 'sets of alleles' is not the same as 'more than one gene'.



(2)

Those are the characteristics that are controlled by more than one gene at different loci. This leads to continuous variation.

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Examiner Comments

This response is on the right lines, although it would have been better if the candidate had written 'a characteristic controlled by more than one gene at different loci'.

However, the context was enough to give this response full marks.

Question 3 (b)(i)

Questions asking for a calculation of a percentage change are often poorly answered and this was no exception. Most candidates were able to select the correct values of 1.72 and 1.76 and it was rare for candidates to gain no marks, unless they chose to calculate the mean for all heights instead of a percentage change. Some candidates noted the word 'mean' in the question but failed to notice that the data provided in the table referred to mean values.

A common error was for candidates to divide the difference between 1.72 and 1.76 by 1.76 (the final height) rather than by 1.72 (the original height). Therefore an answer of 2.32 or 2.32 was required and not 2.3, as rounding up from an incorrect calculation producing 2.27 would give 2.3.

Candidates must learn how to calculate percentage changes.

(b) The table below shows the mean heights of adult men in Northern and Southern Europe from 1955 to 1980.

Year	Mean height of adult men / m	
	Northern Europe	Southern Europe
1955	1.78	1.72
1960	1.78	1.73
1965	1.79	1.74
1970	1.79	1.74
1975	1.79	1.76
1980	1.80	1.76

(i) The percentage change in mean height of adult men in Northern Europe from 1955 to 1980 is 1.12%.

Using the information in the table, calculate the percentage change in mean height of adult men in Southern Europe from 1955 to 1980. Show your working.

(3)

$\frac{1.76 - 1.72}{1.76} \times 100 = 2.27\%$

2.27 (%)

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Examiner Comments

This was a common mistake, calculating the percentage change by dividing the change in height by the final value and not the original value. One mark was given for answers like this for selecting the correct two values.

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Examiner Tip

If asked to show your working you must do this. This candidate has managed to gain one mark by showing their working containing the correct values from the table. If they had just written 2.27 they would have gained no marks at all.

(b) The table below shows the mean heights of adult men in Northern and Southern Europe from 1955 to 1980.

Year	Mean height of adult men / m	
	Northern Europe	Southern Europe
1955	1.78	1.72
1960	1.78	1.73
1965	1.79	1.74
1970	1.79	1.74
1975	1.79	1.76
1980	1.80	1.76

(i) The percentage change in mean height of adult men in Northern Europe from 1955 to 1980 is 1.12%.

Using the information in the table, calculate the percentage change in mean height of adult men in Southern Europe from 1955 to 1980. Show your working.

(3)

$\frac{1.76 - 1.72}{1.72} \times 100 = 2.33$

2.33 (%)

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Examiner Comments

A perfect answer. Gains all three marks.

Question 3 (b)(ii)

Many answers compared the height of the two groups rather than the **changes** in height as instructed in the question. Others mistakenly stated that there was a greater change for Northern Europeans, having misread the table. This suggests that candidates are not reading the question carefully and are not taking the time to study the data provided.

Candidates also lost marks for not making comparisons between Northern and Southern Europeans, some just reiterated what the height was by reading it off the table for Northern Europeans and Southern Europeans during those years. Although a lack of units was not penalised, incorrect units were worrying with some references to an increase in height of 2 or 4m!

The commonest mark awarded was for noting a greater change in height for Southern Europeans than Northern Europeans, although not all automatically gained the mark for an increase in the height of both as some forgot to refer to height.

(ii) Using the information in the table, compare the changes in mean height of men from Northern Europe with those from Southern Europe between 1955 and 1980.

(3)

The mean height of men in Northern Europe is more than the men in Southern Europe. ~~The mean~~ of The mean of both heights increases as the year pass by. ~~At~~ In 1955 the mean hight for Southern was 1.72m while in the North it was 1.78m in 1980 ~~that~~ the numbers increase to 1.80m in the North and 1.76 in Southern Europe.

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Examiner Comments

Many candidates did the same as this candidate - they described the height of men in Northern Europe as being greater than that of men in Southern Europe. The instruction was to compare 'the changes in mean height' not to compare 'the mean heights'.

This gained one mark for stating that the heights for both groups increased.

(3)

~~The chang~~ In Southern Europe the mean hight of adult men increased from 1955 to 1980 by (0.04m) while in ~~Sout~~ nothern Europe the mean hight in adult men decreased by (0.02m).

The ~~change~~ change in ~~hight~~ southern Europe was higher than the change in hight in Northern Europe by 0.02m There was no change in the mean hight in Northern Europe from 1955 to 1960 while the mean hight in southern Europe increased by

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Examiner Comments

This response starts well with reference to an increase in the height of men in Southern Europe by 0.04m - however, this is followed by an incorrect suggestion that the height of men in Northern Europe decreased, even though the change in height is correctly stated as 0.02m!

So, one mark can be given for correct manipulation of data and another one for the next sentence where reference is made to a greater change in height for men in Southern Europe.

If this candidate had checked the data and their answer and changed 'decreased' to 'increased' they would have achieved full marks.

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Examiner Tip

Remember to check what has been written - decrease ≠ increase !

Question 3 (b)(iii)

The only creditworthy answers that were regularly seen contained references to differences in genes or differences in diet.

Most answers tended to be quite vague and lacked precision. Some candidates did not answer the question; they discussed the reasons for **an increase in height,** rather than the **difference in height**, as was instructed in the question.

Surprisingly, some thought that differences in sunlight and altitude would affect height, whilst others linked levels of exercise to the height of individuals.

(iii) Suggest an explanation for the difference in height between the men from Northern and Southern Europe.

(2)

Since height is polygenic and has continuous variation, the enviroment may have had an effect. Maybe in Northern Europe men are more well fed so are generally taller and grew to their maximum potential. However, the percentage increase in height is higher in Southern Europe, so perhaps they started to eat better or drink more milk (calcium).

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Examiner Comments

On the whole this is a vague answer, only at the very end does it gain a mark for referring to greater intake of calcium, even though the context is that of a greater change in height for Southern Europeans.

Suggesting that Northern European men 'are more well fed' is not enough at this level to achieve a mark.

Maybe certain alleles for taller humans was more abundent in nothern europe than Southern. Also since they are different regions, certain diets might have been more readily available in north Europe. (Oats that are higher in protein)

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Examiner Comments

This is a good answer, clearly referring to differences in genotype and diet - with accurate reference to alleles for tallness and diet higher in protein.

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Examiner Tip

Careful use of the correct terminology will make the difference and gain marks.

Question 4 (b)

Sustainability was a concept well understood by most candidates. Those who failed to score tended to refer to carbon-neutrality or to use phrases like 'eco-friendly'.

There were many references to the biodegradable nature of the sweet potato rather than the fact that it provides a renewable resource; apart from being completely irrelevant to the context of biofuel, it is not a feature of sustainability. The idea of replanting the sweet potatoes had to be in the context of growing more plants rather than regrowing the ones that are used for biofuel production.

(b) Starch can be converted into biofuel. Varieties of sweet potato are being developed for biofuel production.

Suggest why this use of sweet potatoes is an example of a sustainable resource.

(2)

Sweet potatoes contain starch, which is ~~biodegraded~~ biodegradable and can be decomposed by bacteria, and doesn't accumulate in the environment.

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Examiner Comments

Although the statements here are correct, they do not answer the question.

The stem of the question refers to using the starch being used to make biofuel - therefore it does not matter if it is biodegradable!

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Examiner Tip

Check that your answer actually answers the question. Don't just check what you have written - re-read the question as well!

Sweet potatos are obtained from plants. Plants can be regrown and replanted. Plant is a renewable resource.

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Examiner Comments

This is a good answer - clearly stating that the sweet potatoes come from plants which can be replanted and that plants are a renewable resource.

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Examiner Tip

Remember it is the resource used which is renewable, not the material used. So, the starch is not renewable as it is used up making biofuels, but the plants can be replaced and they are renewable.

Question 4 (c)(i)

This question was very well answered by many candidates, with references to amino acids and protein synthesis. The use of proteins as enzymes was another commonly given answer. However some just stated that the nitrates were for 'growth and repair' or to prevent symptoms of deficiencies. Some incorrectly suggested that amino acids are components of DNA and others just stated 'amino acids and proteins' without explaining the fact that nitrates are needed to produce amino acids which are used to synthesise proteins. Many referred to 'chlorophyll', probably confusing the role of magnesium for that of nitrate, but as the chlorophyll molecule does contain nitrogen, this was credited and given a mark where it appeared. There were also some answers that suggested nitrate was needed for starch and other carbohydrates.

(i) Suggest why sweet potato plants need nitrate ions.

(2)

So The sweet potato plants need nitrate ions to produce more sweet potato at a faster rate and with more nutrients

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Examiner Comments

A vague answer, indicating that the candidate knew that nitrate ions are required for growth without explaining their specific importance to plants.

(2)

They need it to make DNA and to for protein synthesis. It is also used in photosynthesis.

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This response gained two marks - one for reference to DNA and one for protein synthesis. The vague reference to it being required for photosynthesis was ignored.

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Examiner Tip

Learn the roles of the three mineral ions referred to in the specification - **nitrates, magnesium** and **calcium**.

Question 4 (c)(ii)

In order to produce good answers to this question, it was necessary for candidates to review the data provided in the table. Surprisingly few mentioned the fact that only a few levels of nitrate were tested, although many did comment on the wide interval between the values used and that the optimum could lie between either 0 and 30 or 30 and 60 kg ha^{-1}. Many mentioned repeats but failed to provide any further detail on either the nature of the repeats or their purpose. Many candidates gained a mark for referring to other factors such as the soil type, other minerals in the soil or temperature differences.

(ii) 'The optimum level of nitrate fertiliser for sweet potatoes is 30 kg per hectare.'

Suggest reasons why this statement may **not** be valid.

(3)

There is no data about controlled variable such as PH of soil and other menirals in the soil this affect mass of the root, need more data about measuring techniques and way fertilser added to the soil, there should be more ~~intervals between~~ levels to determine the optimum level, and should be repeated several times.

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Examiner Comments

This is an example of a response that nearly achieved full marks but did not due to lack of precise details. One mark was given for describing a number of possible environmental factors that could have affected the results - including soil pH and other minerals in the soil.

Stating that 'there should be more levels' does not gain a mark without clear reference to the fact that there were only three different levels of nitrate used, or reference to testing levels in between those actually tested.

'Should be repeated several times' is not enough - if the candidate had referred to repeats at each level of nitrate or repeats used to calculate mean values, they would have gained the mark.

(ii) 'The optimum level of nitrate fertiliser for sweet potatoes is 30 kg per hectare.'

Suggest reasons why this statement may **not** be valid. between each (0, 30, 60) (3)

The range or difference of 30 kg is very big. The optimum level could be between 30 and 60. Perhaps 35 or 40. There fore it is not reliable. There should be more intervals. (not many in this investigation)

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Examiner Comments

This response gains a mark for reference to the range being large and that there should be more intervals, even though nitrate is not mentioned. Another mark was given for stating that the optimum level could be between 30 and 60.

However, this would have been a better answer if levels of **nitrate** had been referred to.

Question 4 (d)

This question was straightforward for the majority of candidates, but unfortunately several referred to, and described, phloem instead of xylem. Others referred to the root hair cells and active transport, not answering the question that asked for a description of the tissue that 'transports nitrate ions from the roots to the stems of plants'.

Quite a few described the mechanism of transport, including reference to the symplast and apoplast pathways, which are not on the specification and will not be tested

Another common error was to refer to xylem consisting of lignin; many candidates use the word **'consist'** when they mean **'contain'** - this frequently loses marks. Poor phrasing and difficulties in describing the structure of the tissue also lost marks.

(d) Describe the structure of the plant tissue that transports nitrate ions from the roots to the stems of plants.

(2)

The structure of the plant tissue that transports nitrate ions from the roots to the stems of plants is a smooth tissue that allows for active transport to take place in order for the nitrates to reach the stem.

ResultsPlus
Examiner Comments

This answer refers to active transport instead of describing the tissue. It does appear that this candidate did not realise that the question was about xylem.

The xylem tissue is a hollow tube of cells covered by lignin and made up of cellulose. The cells line up and the content inside them dies, leaving the strong cell wall covered in impermeable lignin to the water escapes. It is a rigid tissue as it is made from cellulose.

ResultsPlus
Examiner Comments

This response did gain credit for reference to the tissue being hollow and for reference to the presence of lignin.

However, the phrasing is weak and the actual structure of xylem is not described accurately - the cells are not 'covered in lignin', the cell walls contain lignin. Also, reference to xylem being made of cellulose is also inaccurate - again, the cellulose is in the cell walls, which is the case for all plant cells, and is not a specific feature of xylem.

Question 5 (a)(i)

Most candidates correctly picked the relevant line on the graph for 5°C, but then failed to explain that the percentage of germination increased as storage time increased from one to two months.

Merely stating that there was an increase and then a decrease, without giving a time frame, was a common cause of lost marks.

Some candidates referred to years or days instead of months, indicating that the graph was not as carefully studied as it should have been. Questions that contain the instruction 'using the information in the graph' should prompt candidates to study the data provided and then refer to it in their answers.

(a) (i) Using the information in the graph, describe the effect of storage time on percentage germination of seeds stored at 5 °C.

(2)

From 1 to 2 months the percentage germination increases, reaching it's peak at 2 months which equals to 86%. From 2 to 8 months the germination success decreases by 86 - 70 = 16%

ResultsPlus
Examiner Comments

An example of the most common answer, clearly referring to an increase in germination from 1 to 2 months time in storage, followed by a decrease from 2 to 8 months.

Question 5 (a)(ii)

The most commonly awarded mark for this question was for describing the relationship between temperature and germination rate. However, few gained the marking point for describing little difference between the three different temperatures up to two months, although many noted that germination increased for all three storage temperatures in the first two months.

Many just quoted actual figures from the graphs, stating the percentage germination achieved at the different temperatures, assuming this provided evidence that germination decreased with an increase in temperature. Relatively few actually worked out the difference in percentage germination between any of the storage temperatures.

There were also those who had misread the question and stated that as time increased, percentage germination decreased. A few claimed that the relationship between temperature and percentage germination showed negative correlation and then explained that as temperature increased so did percentage germination! There was evidently a confusion between the terms 'decrease' and 'increase', with candidates muddling the two and losing marks as a consequence.

(ii) Using the information in the graph, describe the effect of storage temperature on the percentage germination of the stored seeds.

(2)

As the storage time increases the percentage of germination increases to the optimum level of storage time which is (2 months) ~~then~~ then it gradually decreases.

ResultsPlus
Examiner Comments

An example of an answer that is factually correct, yet fails to answer the question. This describes the effect of storage time on germination and not storage temperature.

ResultsPlus
Examiner Tip

Read questions carefully - do not rush and skim read the instructions.

Always check both the question and your answer when checking your work.

(2)

As the temperature increase the ~~pe~~ germination percentage decreases showing a negative correlation. The least fall in germination at the end of 8 years was with 5°C which was decreased to 70% percent and for the maximum fall in percentage germination was with 22°C which fell from 84% to 4%

ResultsPlus
Examiner Comments

This response gains one mark for correctly describing the relationship between storage temperature and percentage germination. However, if there was only reference to a negative correlation no mark would have been given as there is an initial increase in germination.

(2)

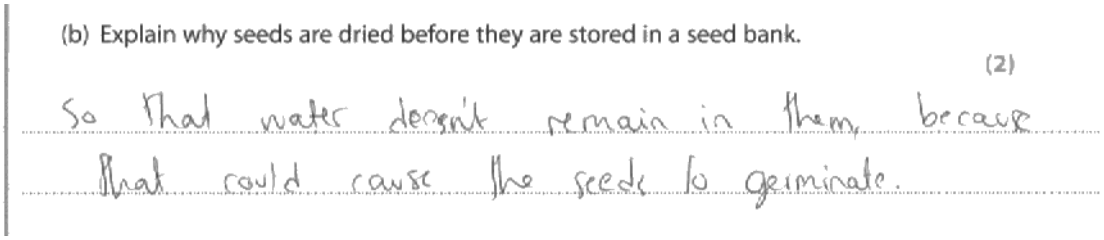
as the storage ↑ temperature ↑ increase the percentage germination decrease So 22°C shows the least percentage of germination after storage for 8 months and 5°C shows the highest percentage of germination. After 8 months the percentage germination at 5°C is higher than that at 15°C by 34%

ResultsPlus
Examiner Comments

This gained two marks - one for stating that as 'storage temperature increases the percentage germination decreases' and another for correctly calculating a difference between two of the temperatures - 'after 8 months the percentage germination at 5°C is higher than 15°C by 34%'.n.

Question 5 (b)

This question was generally well understood, although vague answers about water freezing in the seeds often made it difficult to award marks, e.g. 'to avoid the freezing effect'.
A small but significant minority approached this as if they had been asked to describe variables to be controlled in an investigation. Many stated that drying the seeds was done in order to remove water from them, which is stating the obvious, instead of explaining why this was done before storing the seeds. Many good answers referred to the reduction of enzyme activity linked to the prevention of either germination or microbial growth. Some candidates lost marks by stating that the absence of water would prevent microbes being present rather than preventing the growth of microbes.

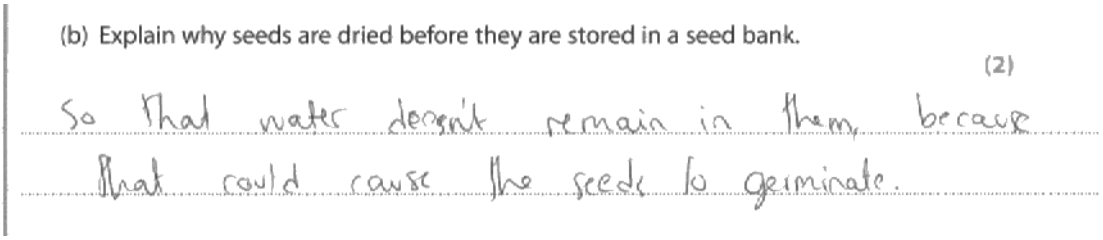

(b) Explain why seeds are dried before they are stored in a seed bank.

(2)

So that water doesn't remain in them, because that could cause the seeds to germinate.

ResultsPlus
Examiner Comments

A basic answer that was commonly given, recognising that water would allow the seeds to germinate.


(b) Explain why seeds are dried before they are stored in a seed bank.

(2)

So that water doesn't remain in them, because that could cause the seeds to germinate.

ResultsPlus
Examiner Comments

A very thorough response, referring to freezing damage, germination, growth of harmful bacteria and rotting of the seed.

ResultsPlus
Examiner Tip

If you can think of several reasons when asked to provide an explanation it is worth writing them all down, in case one of your ideas is wrong, or not worded clearly.

Question 5 (c)

Many candidates explained the purpose of seed banks or how they go about storing seeds. Others discussed the advantages of seed banks, e.g. 'they can keep lots of seed as they don't take up a lot of room'. Only a few answers correctly referred to the collection of seed from many plants, of the same species, in order to create a large gene pool in the collection of stored seed. Some made reference to the cross-breeding of seeds to generate greater genetic diversity, trying to apply their knowledge of conservation of genetic diversity in animals kept in zoos to seeds in seed banks.

(c) Describe how seed banks could conserve the genetic diversity of endangered species.

(2)

Seed banks could develop a breeding programme where they breed the endangered species (making sure they seeds are not closely related to prevent inbreeding) and this way they increase the genetic pool of the endangered species meaning that there is now more genetic diversity.

ResultsPlus
Examiner Comments

Many candidates produced answers like this - referring to a breeding programme for seeds. However, the processes involved in maintaining genetic diversity in animal and plant species are not the same. The main job of seed banks is storing seeds, not breeding plants.

(2)

it take large number of seeds from several plant of endangered species with different sizes and shapes to increase number of different alleles so increase genetic diversity

ResultsPlus
Examiner Comments

This answer gained full marks for referring to a large number of seeds of the endangered species and also to ensuring a number of different alleles were represented in the collection by collecting seeds of varying sizes.

ResultsPlus
Examiner Tip

Remember that genetic diversity refers to variety of alleles and not genes. Different species may have different genes, but within a species the genes are the same, although there may be different alleles for these genes.

Question 6 (a)

There were many descriptions of stem cells 'turning into' or 'becoming' specialised cells – a better definition would be that a stem cell is a totipotent or pluripotent cell that can give rise to, or differentiate, into specialised cells. Many answers referred to stem cells repairing the damaged tissue – a phrase directly taken from the wording of the question- instead of replacing the damaged cells. Some candidates incorrectly referred to stem cells repairing the damaged cells. There were some references to the stem cells continuously dividing, which is equivalent to these cells having no Hayflick limit, a term that is occasionally used by candidates, although not one that examiners would expect them to know. However, a number of candidates wrote of 'rapidly dividing cells' which is not the same as cells capable of continuous division.

Many referred to the stem cells being unspecialised – and although this is true, it is not an example of a property of stem cells that enables them to repair the damaged tissue. It is important that candidates take into account the context of the actual question and do not just write everything they know about a subject such as stem cells.

(a) Describe the properties of stem cells that enable them to repair the damaged tissues.

(2)

multi potent almost unspecialized cells that can give rise to some types of cells including damaged tissue in knee joints

ResultsPlus
Examiner Comments

This gains one mark for describing the cells as multipotent.

No mark can be given for suggesting that these cells give rise to cells 'including the damaged tissue in knee joints' as this implies that the stem cells would produce damaged tissues. A better answer would state that these cells would replace the cells in the damaged knee tissue.

(2)

Stem cells are undifferentiated cells that can give rise to all types of cells (totipotency). ~~If~~ they can replace cells in the damaged tissue.

ResultsPlus
Examiner Comments

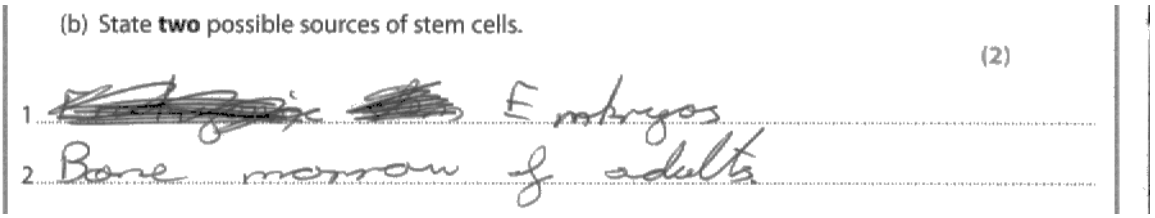
This response gained full marks for reference to totipotency and replacing the cells in the damaged tissue.

Question 6 (b)

This was generally well answered, the commonest correct answers being 'bone marrow' and references to embryos. 'Embryonic stem cells' was an acceptable answer as it clearly referred to stem cells derived from embryos, whereas 'adult stem cells' could not be accepted without naming a more specific source tissue.

Some candidates just wrote 'IVF' – not in itself correct, although those candidates probably meant embryos created by IVF. 'Zygote' was also incorrectly named as a source of stem cells, by some apparently unsure of the names of the stages of embryo development. Good responses referred to the blastocyst and to a variety of organs or tissues that are used as sources of stem cells.

There were also occasional references to plant tissues, including xylem, sclerenchyma and phloem, suggesting that a few candidates had not taken into account the context of the question and were naming tissues found in the stems of plants. It is essential that candidates read the whole question, starting with the introduction, to ensure that they know the context.


(b) State **two** possible sources of stem cells.

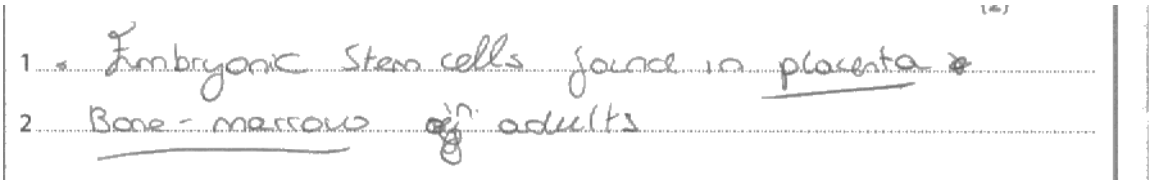
(2)

1 [redacted] Embryos

2 Bone marrow of adults

ResultsPlus
Examiner Comments

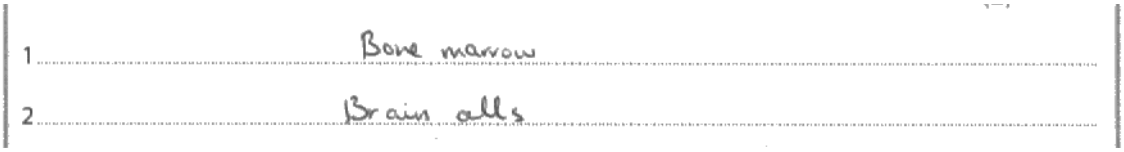
Typical answer gaining full marks. Simply stated and correct.


1 Embryonic Stem cells found in placenta

2 Bone marrow of adults

ResultsPlus
Examiner Comments

This response incorrectly states that embryonic stem cells are found in the placenta, indicating that the term 'embryonic stem cells' has been misunderstood. It would have been better to have written 'embryonic stem cells' as one source and the 'placenta' as a second source.


1 Bone marrow

2 Brain cells

ResultsPlus
Examiner Comments

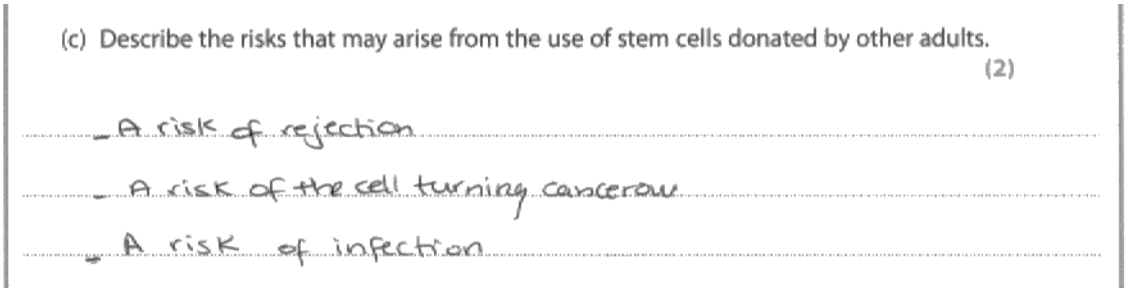
'Bone marrow' gains one mark. No mark for 'brain cells' as these are not a source of stem cells as they are specialised cells. However, 'brain' as an organ would have been accepted as a source of stem cells.

Question 6 (c)

This was generally well answered, with many recognising rejection as an issue and others identifying the risk of infection. However, some answers lacked specificity when referring to infections, or referred to contaminated needles as a source of infection instead of the cells from another person.

A few suggested that genetic diseases might somehow be transferred.

There were some references to immunosuppressant drugs as well, indicating that this was an aspect of stem cell therapy that was well understood.


(c) Describe the risks that may arise from the use of stem cells donated by other adults.
(2)

- A risk of rejection
- A risk of the cell turning cancerous
- A risk of infection

ResultsPlus
Examiner Comments

A simple, straightforward response clearly listing three potential risks.

ResultsPlus
Examiner Tip

Bullet points are useful when making a list of points as it helps both candidate and examiner.

They may be rejected by the donor causing serious problems, they can be infected. They could divide in an uncontrolled way, and this could lead to cancer.

ResultsPlus
Examiner Comments

This response suggests that rejection would be suffered by the donor and not the person being given the stem cells. There is an indication that the cells may transfer an infection - 'they can be infected' - but this is not clear.
However, the explanation for how the stem cells may cause cancer is accurate and well phrased 'could divide in an uncontrolled way and this could lead to cancer'.

Pathogens may be transfered which cause diseases and also there is a risk of rejection from the patients body.

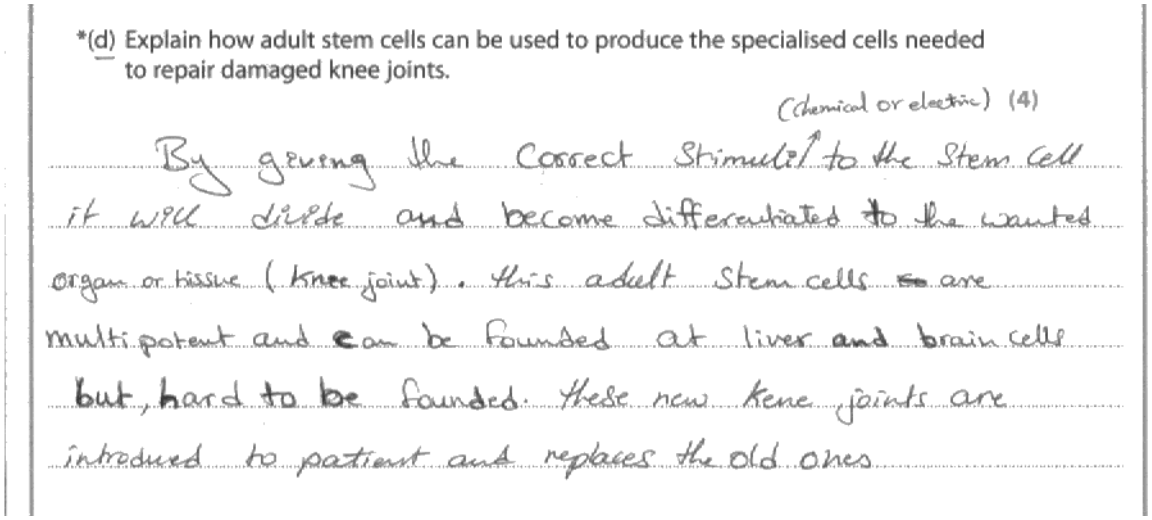
ResultsPlus
Examiner Comments

This candidate clearly understands that pathogens could be transferred causing diseases. However, it would be better to state that there is a risk of rejection **by** the patient's body and not **from** it.

Question 6 (d)

Those candidates who recognised that this was a question about cell differentiation performed well, whereas others who focused on the collection and subsequent injection of the stem cells into knee joints failed to achieve more than one mark maximum. This was a consequence of candidates not taking into account the need to apply knowledge to unfamiliar contexts, and instead of thinking about the processes required for a stem cell – which many had referred to as capable of differentiating in 6(a)- to give rise to the cells required to repair the damage to the knee joint, they focused on the mechanics of obtaining these cells and putting them into the knee joint.

However, there were many very clear answers that gained full marks. A common mistake in the wording of some answers was stating that mRNA was transcribed instead of the DNA or the gene being transcribed, although credit was given for descriptions of mRNA being produced by transcription.



*(d) Explain how adult stem cells can be used to produce the specialised cells needed to repair damaged knee joints.

(chemical or electric) (4)

By giveing the Correct Stimuli/ to the Stem cell it will divide and become differentiated to the wanted organ or tissue (knee joint). this adult Stem cells ~~is~~ are multipotent and can be founded at liver and brain cells but, hard to be founded. these new kene joints are introduced to patient and replaces the old ones

ResultsPlus
Examiner Comments

This candidate has realised that a chemical stimulus is required to cause the stem cell to become differentiated, but does not go into the required detail of what happens next.

ResultsPlus
Examiner Tip

Check the number of marks given for a question and make sure that the answer contains enough relevant details to achieve as many of the available marks as possible.

(4)

With the stem cell a stimulus must be present (hormone, enzyme) which leads to the switching on and off of the genes required to repair the damaged knee joints. Once the correct genes are switched on then they may be transcribed ~~them~~ by mRNA in order to produce more of the specialised cells. Once this occurs, the change is permanent.

ResultsPlus
Examiner Comments

This answer correctly refers to a stimulus in the form of an enzyme of hormone, the switching on of genes and then the transcription of switched on genes. However, no reference is made to protein synthesis which causes the cells to become specialised, instead mRNA is linked to the production of more cells.

Adult stem cells are multipotent. They can be obtained from bone marrow. If a chemical stimulus is sent to such a cell, some genes will be switched on and some would be switched off. The active genes would then be transcribed and a protein would be synthesized. It would alter the structure and functions of the cell so that it could be turned into a knee joint cell.

ResultsPlus
Examiner Comments

This answer gains marks for correct references to a chemical stimulus, switching on of genes, transcription of active genes, protein synthesis and the altering of the structure and function of the cell so that it becomes a 'knee joint cell'.

A nice, well-written answer using correct terminology, applied to the context of the question, and gaining full marks.

Question 7 (a)

Most candidates could describe the basic procedure to compare the tensile strength of the white and brown coir fibres, showing that they could apply the method used in the core practical. Some described the soaking or retting of the fibres beforehand, which was ignored as it was irrelevant.

Those who did not achieve more than two marks often wrote a lot but their responses were vague and lacked descriptive detail on the design of the experiment.

A significant number of candidates referred to the need for repeats but failed to mention a reason for this, such as enabling a mean value to be calculated. It was very rare for a candidate to describe what to do with an anomalous result or to describe how to calculate tensile strength, but the better responses often included both.

It was disappointing that some candidates tried to name the independent and dependent variables and either had no idea what they were in this experiment or got them the wrong way round, such as suggesting that the force applied was the dependent variable.

Although many referred to the control of environmental variables, not all were specific; answers such as 'conditions ought to be kept the same' cannot be given credit as this is too vague.

(a) Suggest how a valid investigation could be carried out to produce reliable data to compare the tensile strength of white fibres and brown fibres.

(4)

both fibres are obtained, having same length and diameter. Then using a force meter hang to each fibre certain mass and change the mass till the fibres breaks, repeat 3 times at each mass. with both fibres same masses should be added and control the variables such as temperature and record results. wear a plastic glasses as a protection.

ResultsPlus
Examiner Comments

This response gained marks for reference to fibres being of the same length, changing the mass until the fibre breaks and controlling temperature.

Repeating three times at each mass is not relevant - repeats should be for each type of fibre.

Wearing plastic glasses as a protection is too vague - there is no description of what is being protected and what from. A better answer would state that 'wear plastic glasses to protect

Question 7 (b)(ii)

Unfortunately there were many answers describing a comparison between the brown and white fibres, ignoring the context of the question which was length of fibres. The best approach to this question was to focus on a comparison of short and long fibres. Good answers came from candidates who studied the graph and realised that **only** the white fibres supported the statement. Many referred to the fact that there was no significant difference in the tensile strength of the short (5mm) and long (35mm) white coir fibres and that the ranges of tensile strength overlapped for these fibres.

(ii) 'The length of the fibre has no significant effect on the tensile strength of the fibre.'

Explain how the information in the graph supports the statement.

(3)

For white fibre, the mean tensile strength is almost the same despite their length difference. For brown fibre, the mean tensile strength from 220 to 340 kPa is a great rise for same length change in fibres. This means that despite the length difference no change is made therefore the change in length does not effect the mean tensile strength of the fibres.

ResultsPlus
Examiner Comments

This answer gained one mark for noting that the tensile strength of the white fibres was 'almost the same despite their length'.Discussion of the brown fibres is irrelevant as the data for those fibres does **not** support the statement in the question.

- In white fibres there was no significant difference between tensile strength at 35mm and 5mm which was only 15 Mpa and there was also over lapping between its error bars
- Both white fibres at 35 mm and 5mm had results in common (150 Mpa, 160 Mpa, 170 MPa, 180 MPA).

ResultsPlus

Examiner Comments

This is a very good answer explaining that there is very little difference in the tensile strength of the long and short white fibres. This candidate has also noted that the mean values for each fall within the range of the other length of fibre. Then there is a clear statement concerning the fact that the white fibres provide evidence that supports the conclusion described in the question.

(3)

For white fibres, there is very little difference between the tensile strength of long and short fibres. Each mean value is within the range bars of the other value (for white fibres). Therefore the change in tensile strength between short and long white fibres can be considered to be absent, which supports the statement.

ResultsPlus

Examiner Comments

Another good answer referring to no significant difference between the 5mm and 35 mm white fibres, overlapping error bars and data used from the graphs to illustrate the overlap.

Question 8 (a)

Some candidates just described what is meant by a habitat whilst many ignored the instruction in the question which required them to use the Tasmanian devil as an example.

Some simply dropped the name into a definition, such as 'the niche of the Tasmanian devil is the role it plays in its ecosystem', which does not explain how it does this. There were some suggestions that the role of the Tasmanian devil was to keep Tasmania neat and tidy by clearing up dead bodies.

Others muddled niche with other ecological terminology, offering definitions for everything from habitat to endemism. However, many did refer to the Tasmanian devil's role as a nocturnal scavenger to gain full marks.

(a) Using the Tasmanian devil as an example, explain what is meant by the term **niche**.

(2)

niche is a species or type of animals of bacteria or any Living organism which is found in only one place in the world as they adapt very hard so they are only found in one place or they can't move as tasmanian devil which is found only in Australia ~~which~~ which is a huge island so it cannot move to other places as it can't swim neither fly.

ResultsPlus
Examiner Comments

An example of a definition of **endemism** instead of **niche**.

ResultsPlus
Examiner Tip

Learn the key vocabulary of the subject - make sure that terms referred to in the specification are clearly understood and can be described.

It is the role of a species / organism within its habitat and location and ecosystem. This may be feeding niche or recycling niche or cleaning niche. It results from the way the organism interacts with the environment and other organisms. The Tasmanian devil eat dead bodies so is a herbivore and decomposer.

ResultsPlus
Examiner Comments

This is another example of muddled understanding of biological terms. The first line gains a mark for a definition of niche. Reference to interactions with the environment and other organisms is also correct. However, referring to the Tasmanian devil eating dead bodies to make it a herbivore (an organism that eats plants!) and a decomposer is not accurate.

A niche describes the position of a species within an ecosystem. It includes its habitat, the Australian island of Tasmania, its interactions with living organisms: it its bodies of deat animals and its interactions with the non-living environment.

ResultsPlus
Examiner Comments

This is a good answer, the only problem being some careless spelling mistakes, i.e. 'it its the bodies of deat animals'. Checking the answer could have addressed this problem, especially as the phrase used was present in the introduction to the question.

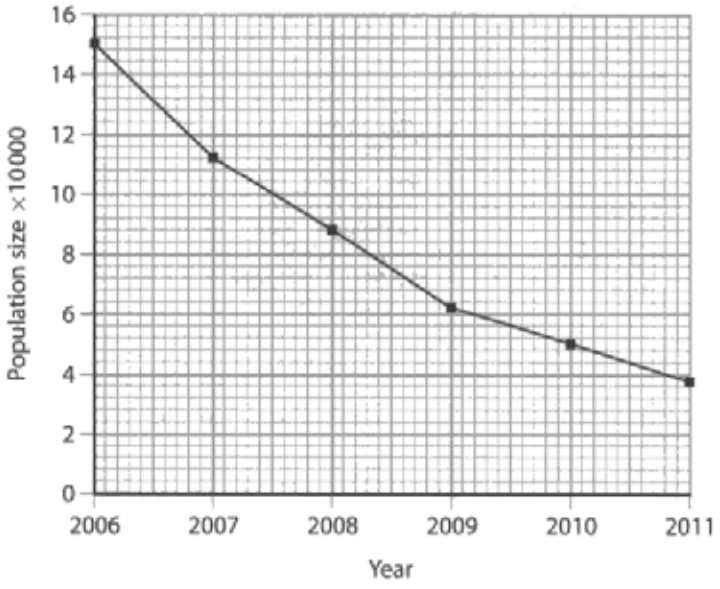
Question 8 (b)

It was quite common to see answers describing the changes in population size between the years 2006 and 2011, and not using the graph to predict what might happen after 2011. Answers suggesting the Tasmanian devils would become extinct were much more common than those suggesting the population would stabilise at a lower level, although both were acceptable.

Some candidates did not make it clear whether they were reporting past trends of decline or were predicting a future trend; this was most often caused by the use of the present tense rather than the future.

A few tried to predict the beneficial effects of captive breeding or other conservation measures, missing the point of the question, which contained the instruction 'using the information in the graph'.

(b) In 1995, there were almost 250000 Tasmanian devils in the wild.
The graph below shows the population size of Tasmanian devils from 2006 to 2011.



Using the information in the graph, suggest what might happen to the population of Tasmanian devils in the wild after 2011.

(2)

Between 2006 and 2011, the population of Tasmanian devils has fallen from 150000 to 38000. This could be due to predators eating them or because there are less animals dying in the island and therefore, Tasmanian devils have each time less food to eat.

ResultsPlus
Examiner Comments

This answer describes what has happened to the population size from 2006 to 2011 and suggests reasons for this decline. Although the information given is not incorrect, it is not the answer to the question.

The population may stabalise and stop decreasing. The graph shows a trend in a decrease in the gradient of the graph (the gradient is levelling). The population is decreasing by less every year.

ResultsPlus
Examiner Comments

This response describes a possible levelling off of the population size in the future using evidence from the graph.

If it continues with the same trend, population size of Tasmanian devils would further increase after 2011 and this might make them endangered and probably might ~~ever~~ lead to their extinction.

ResultsPlus
Examiner Comments

One mark was given for reference to a possibility of extinction in the future. However, due to referring to **'increase'** instead of **'decrease'** no mark was given for the first sentence.

This candidate refers to the trend continuing, 'with a further **increase** after 2011'.

ResultsPlus
Examiner Tip

Make sure that the words **'decrease'** and **'increase'** are used correctly.

Question 8 (c)(i)

There were many vague answers referring to genetic variation. Some referred to a variety of 'genes' rather than 'alleles' whilst others failed to link their statement to a gene pool or species

.

(i) State what is meant by the term **genetic diversity**.

(1)

Genetic diversity is the number of different alleles in the gene pool of a species.

ResultsPlus

Examiner Comments

A good definition referring to the number of **different** alleles in a gene pool of a species.

Note: reference to number of alleles alone would not be enough to gain the mark for this question.

number of different genes with all their different alleles of species.

ResultsPlus

Examiner Comments

Although this answer uses the words 'different', 'alleles', 'genes' and 'species' the meaning is not clear.

A better answer would be ' the number of different alleles for the genes in a species'.

Question 8 (c)(ii)

Although most candidates did recognise that a low genetic diversity would reduce the chance of survival of the species, fewer were able to explain that this was as a consequence of a small gene pool.

Some just repeated the statement in the question, suggesting that a low genetic diversity would affect the survival, not explaining how the survival of the species would be affected. There were also a significant number of responses that suggested that DFTD was an inherited disease and that a low genetic diversity would increase the chances of survival of the Tasmanian devil. There were many responses that were on the right lines but failed to gain full marks due to reference to advantageous 'genes' instead of 'alleles'.

(ii) The Tasmanian devil is threatened by a contagious disease known as Devil Facial Tumour Disease (DFTD). This disease was first observed in 1996.

The disease is spread when the Tasmanian devils fight over food and bite each other.

Suggest how a low genetic diversity could affect the chances of survival of the Tasmanian devil as a species.

(3)

With low genetic diversity, the offsprings would have very similar genes to both their parents and this would be carried on through generations. This would prevent Natural Selection from occuring efficiently and so the species would not evolve well to adapt to the surroundings and therefore might go extinct.

ResultsPlus
Examiner Comments

The only mark that can be given for this answer is for the suggestion that the species may become extinct.

If the answer had described similar **alleles** instead of similar **genes**, it would have gained two marks instead of one.

A low genetic diversity would decrease the chances of survival of the Tasmanian devil, as they have a small gene pool with a limited number of different alleles. Tasmanian devils might not be able to overcome the disease, so they would die, decreasing their population size even more. Only a few may have advantageous alleles that can enable them to overcome the disease, as their genetic diversity is low.

ResultsPlus
Examiner Comments

This answer clearly refers to low genetic diversity resulting in a 'small gene pool' with a 'limited number of different alleles'. There is also a correct reference to a reduced chance of individuals having advantageous alleles that would allow them to survive the disease.

Question 8 (c)(iii)

Many candidates failed to understand the requirements for this question as they had apparently not read all the information provided. A large proportion of responses simply referred to captive breeding programmes with **no** reference to the six females immune to the disease. Many referred to the possibility of developing an immunity to the disease, having not read that it already existed. Many candidates referred to the keeping of stud books, inter zoo swapping and the care of animals in zoos, which were not relevant to this particular question. These type of answers indicated that candidates were repeating learnt mark schemes with no reference to the context. The most commonly awarded mark was for knowing that the captive breeding programme might involve IVF, although not all linked that to increasing the numbers of animals with immunity to DFTD. Many responses did refer to reintroduction to the wild, with reference to various ways of preparing the Tasmanian devils before release, some even discussed training them not to bite each other, to reduce the transmission of the disease.

It was disappointing to see so many answers in which there was no reference to alleles at all, and a lot of candidates failed to get some of the marking points because they used the word 'gene' instead of 'allele'.

(iii) Six female Tasmanian devils have been found with immunity to DFTD. A captive breeding programme has been set up using these six females.

Suggest how this captive breeding programme could lead to the development of a population able to survive this disease in the wild.

(4)

- Exchange programs with other zoos to obtain male sperms.
- IVF may be carried out to increase the population size.
- During IVF, embryo splitting may be done to further increase the population size.
- Performing DNA analysis to follow up and track the advantageous allele.
- Keeping studbooks of which individuals mated together.
- Encourage outbreeding and prevent inbreeding of related individuals to increase genetic diversity.

ResultsPlus
Examiner Comments

This is a typical response that describes captive breeding techniques, yet fails to answer the question.

Although IVF is mentioned with reference to increasing population size, it is not linked to increasing the number of Tasmanian devils with immunity to DFTD.

ResultsPlus
Examiner Tip

Don't just repeat mark schemes you have seen when preparing for the exam by doing past papers - read the question and make sure your answer refers to the context.

(4)

Allow ~~those~~ one females to be mated with males to produce zygote, during IVF embryo splitting may be done, the embryos will be implenated in the uterus of the surrogate mother, those embryos will probably ~~have~~ be found with immunity to DFTD. Repeat this with the other 5 females. Over period of times their number will increase ~~so~~ (population size) so they will be more able to survive.

ResultsPlus
Examiner Comments

This answer refers to the use of IVF and surrogates to increase the population size with reference to embryos with immunity to DFTD.

the Tasmanian tiger produced. Fertilised eggs could be produced by in vitro fertilisation which are immune to DFTD and therefore the offspring will be immune too. The six female tasmanian which are immune can breed to produce offspring. The offspring which has been passed the advantageous alleles then can be bred together in order to increase the number of immune individuals. Some of the immune individuals can then be reintroduced into the wild, in a habitat where there is reduced predation to ensure their survival. When they are captive, they must not be given all the resources such as food so that when they are reintroduced they are able to compete for resources.

(Total for Question 8 = 12 marks)

ResultsPlus

Examiner Comments

This is a good answer referring to advantageous alleles being passed on to the offspring by the six immune females, IVF being used to increase the population of immune individuals and then to reintroduction to the wild.

Paper Summary

In order to improve their performance candidates should:

- read all of the details in the questions carefully making sure that they consider the context before writing their answers;
- develop a familiarity with the subject specific vocabulary encountered at this level and learn how to use key words and phrases with precision;
- review all of the recommended core practicals with particular reference to laboratory procedures, ensuring that they are familiar with the processes involved and the equipment used;
- gain practice at interpreting information presented graphically and in tables;
- practice simple mathematical calculations – subtractions, and % differences;
- practice writing longer responses to develop skills in expressing ideas using appropriate scientific terminology.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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