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Examiners' Report
June 2015

IAL Biology WBI02 01

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Introduction

Generally, this paper was well attempted by most candidates. It was evident that some subjects within the specification are better understood than others. Most candidates demonstrated a sound grasp of the factual content of the course, such as the role of the rough endoplasmic reticulum, the function of the pollen tube, the purpose of meiosis and the structures of prokaryotic and eukaryotic cells, which were all well understood by many candidates. When it came to linking structure to function, there were many good answers to questions concerning starch molecules. The application of knowledge concerning the role of zoos in conservation proved more challenging, catching out those who had learnt a particular stock answer and were unable to separate out the issues of inbreeding and conserving genetic diversity in a species.

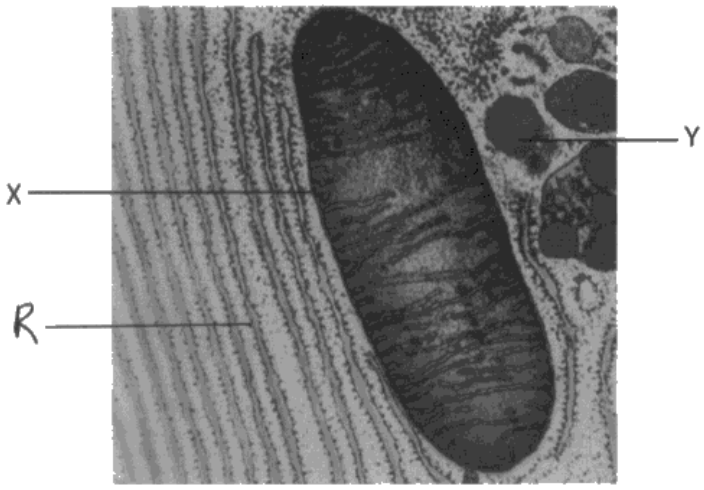
Questions based on core practicals continue to differentiate between those centres where candidates have not only had the opportunity to carry out these investigations, but have also been encouraged to write up these experiments using correct terminology and precise details. Many candidates appeared to be unfamiliar with the processes involved in preparing a root tip squash, many referring to the use of an electron microscope, or how to design an investigation to test the antimicrobial properties of a range of plant extracts.

There were also many occasions when candidates lost marks as a consequence of failing to use the correct biological vocabulary, or confusing terms such as chromosome and chromatid, and cellulose with microfibrils. This is an area that needs to be addressed by centres, reinforcing the need to communicate as scientists at this level of study.

Question 1 (a) (ii)

A straightforward question at the start of the paper, this was answered correctly by most candidates. The most common error was to label the mitochondrial cristae instead of the rER. Few missed the question, probably as a consequence of not seeing any answer lines and moving on to the next part of the question without reading carefully.

1 The photograph below shows part of a cell from the pancreas of a bat, as seen using an electron microscope.



Magnification ×15 000

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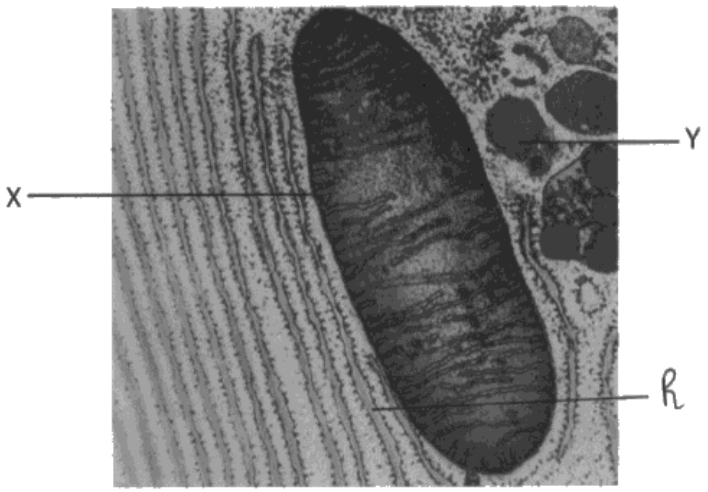
Examiner Comments

A typical correct answer - note that this shows good practice in not having an arrow head on the label line.

1 The photograph below shows part of a cell from the pancreas of a bat, as seen using an electron microscope.



Magnification ×15 000

ResultsPlus
Examiner Comments

This gained the mark - although initially it looks as though the R is labelling the mitochondrion.

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Examiner Tip

If labelling a structure, make sure the label line goes directly to that object without crossing other structures where possible.

Question 1 (b) (i)

This question focused on the role of the rough endoplasmic reticulum in the transport of proteins within the cell. Although there were many good answers to this, some candidates wrote about what happens after the protein leaves the rER to go to the Golgi apparatus, which was not relevant to this particular question; this demonstrates the need to read the context of the question being asked and not relying on mark schemes learnt from previous exam papers.

The main marking points were for referring to the ribosomes **on** the rER (not in it) being the site of protein synthesis, the proteins moving **through** the rER, proteins being folded into their secondary and tertiary structures **within** the rER and then the proteins being packaged **in** vesicles formed by the rER.

Poor expression meant it was not always easy to tell if the vesicle was made by the rER or if it was already made awaiting protein from the rER, there were also references to proteins leaving the rER as vesicles, or the ribosomes moving through the rER and being packaged into vesicles.

(i) Suggest the role of the rough endoplasmic reticulum in the transport of proteins within the pancreas cell.

(3)

The polypeptide chain made in the ribosome enters RER where it is folded into its secondary and tertiary structure.

The protein is then enclosed in transport vesicles that budd off the rough endoplasmic reticulum to go to the golgi apparatus.

ResultsPlus
Examiner Comments

This response covers all the marking points on the mark scheme.

polypeptide chain made at the ribosome

protein entering the rER

protein folded into secondary and tertiary structure (in the rER)

protein enclosed in (transport) vesicles that bud off the rER

3/3

(i) Suggest the role of the rough endoplasmic reticulum in the transport of proteins within the pancreas cell.

(3)

Rough endoplasmic reticulum contains ribosomes. These ribosomes produce proteins. After that, those proteins reach the end of the Rough endoplasmic reticulum and are formed in vesicles that are pinched off and go to the golgi apparatus where its modified; for eg.; addition of carbohydrates or any other modification. Then the vesicle is sent to the cell membrane where exocytosis occurs.

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Examiner Comments

This response gains 2 marks - one for protein synthesis on the ribosomes and one for the packaging of the protein in vesicles at the end of the rER.

Further information about what happens to the protein in the Golgi apparatus and how it leaves the cell, although correct, are not relevant to this particular question.

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Examiner Tip

Read the question carefully and try to keep to the context of the question asked.

Question 1 (b) (ii)

Candidates were told that the structure labelled Y was a secretory vesicle that contained protein and then they were asked to describe its role in the cell. However, despite these instructions, many chose to write about lysosomes and went on to describe the processes of phagocytosis, apoptosis or the breakdown of worn out organelles.

Meanwhile, there were many good responses, effectively relating the sequence of events with the vesicle transporting the protein from the Golgi apparatus to the cell surface membrane and exocytosis. Some, unfortunately lost the mark for exocytosis by referring to endocytosis as well - as if unsure which was the correct process and naming both.

Another error made was in describing the role of the vesicles in moving substances around the **body**, rather than the **cell**.

formed into a vesicle which buds off from the end of the RER and goes to the Golgi.

(ii) The structure labelled **Y** in the photograph is a secretory vesicle that contains protein.

Describe the role of this vesicle in the cell.

(2)

The role of this vesicle is to move towards and fuse with the cell surface membrane (the membrane of the vesicle and cell surface membrane fuse) and release it's contents out of the cell by exocytosis.

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Examiner Comments

This response gained 2 marks for describing the vesicle fusing with the cell surface membrane and releasing its contents by exocytosis.

2/2

exocytosis.

(ii) The structure labelled **Y** in the photograph is a secretory vesicle that contains protein.

Describe the role of this vesicle in the cell.

(2)

Lysosome. Lysosome are secretory vesicles that ~~are~~ fuse with the bacteria so that have invaded the body and absorb the useful substances and release the harmful ones via exocytosis. They are also responsible for complete break down of cell by autolysis. Lysomes have hydrolytic enzymes that help in the breakdown of bacteria

(Total for Question 1 = 7 marks)

ResultsPlus
Examiner Comments

This candidate seemed to be determined to make the secretory vesicle become a lysosome!

Although what they have written may be correct for a lysosome, it is not the role of a secretory vesicle.

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Examiner Tip

Lysosomes are vesicles, but they are not secretory vesicles.

Lysosomes contain enzymes that act within the cell.

(ii) The structure labelled **Y** in the photograph is a secretory vesicle that contains protein.

Describe the role of this vesicle in the cell.

(2)

It transports the protein from the rER to the Golgi apparatus where it is modified. Then ~~from~~ the end of the Golgi apparatus the pinches off ~~vesicle~~ to form ~~these~~ vesicles containing the protein which can be ~~released~~ released

(Total for Question 1 = 7 marks)

ResultsPlus
Examiner Comments

No marks can be given to this response - there is a confusion between transport vesicles that transport proteins from the rER to the Golgi apparatus and the secretory vesicle. There is no reference to the vesicles moving to or fusing with the cell surface membrane.

0/2

Question 2 (b)

This question tested the knowledge of a core practical – the root tip squash procedure, one that is on the specification. Although there were some very good answers, it was also evident that many were unfamiliar with the procedure.

Good answers included reference to hydrochloric acid being used to soften the tissue and the use of an appropriate stain. Many also correctly stated the length of root to be cut or made reference to the meristem, and many also commented on heating to intensify stain. There were also good descriptions of preparing the 'squash', although not all placed the tissue sample on a microscope slide and then covered it with a cover slip – some squashed it between two slides, or in a watch glass, or on the microscope itself. There were also many references to viewing under an electron microscope.

Better answers not only described each stage, but explained the purpose of it, making it clear that they had a sound understanding of the practical.

(b) Describe how to prepare a root tip squash so that chromosomes can be seen.

(4)

Cut off a garlic root tip - this is the apical meristem where mitosis occurs. Transfer the root tip to a watch glass and add a few drops of hydrochloric acid and warm for 5 minutes. Now transfer the sample to a microscope slide and break apart using a mounted needle. The hydrochloric acid in the previous part breaks down the pectins in the middle lamella causing cells to separate- breaking apart with a mounted needle also causes cells to separate.
Now, add 1 drop of Toluidine Blue which makes the chromosomes stained and more visible. Place a coverslip on the sample, place several sheets of filter paper on top of it and squash gently to get a single layer of cells. Warm again to intensify staining, then place under (focus) a microscope and observe the chromosomes.

ResultsPlus
Examiner Comments

This response gains full marks:

- cutting off tip of root with apical meristem
- use of hydrochloric acid to break down middle lamellae
- use of toluidine blue
- preparing the 'squash' between microscope slide and cover slip
- heating to intensify stain (even though not required with toluidine blue)

This candidate has obviously acquired a good understanding of the stages involved in this core practical

4/4

(b) Describe how to prepare a root tip squash so that chromosomes can be seen.

(4)

cut off the tip of a growing root and place it in acid for 2 hours. Remove the tip and macerate it with a needle. Apply some ~~ethanoic~~ staining solution (purple colour) so that ~~mitosis~~ ~~can~~ chromosomes can be seen, then transfer the macerated ~~to~~ squash onto a slide and observe through a light microscope.

ResultsPlus
Examiner Comments

No marks could be given for this, although it did appear that the candidate had some knowledge of the process.

Cutting off the tip of the root is not precise enough and no marks can be given for leaving it in acid without explaining why this is needed. A 'purple colour' 'staining solution' is not the name of an appropriate stain and there is no description of how the squash would be produced.

0/4

(b) Describe how to prepare a root tip squash so that chromosomes can be seen.

(4)

To be able to observe the chromosomes in a transmission electron microscopy of a root squash, it is necessary to stain the membranes and other organelles previously with heavy metal ions. This way, membranes and organelles will appear as darkened areas in the magnified image because the heavy metal ion stain makes them electron opaque. Therefore, the chromosomes will appear darkened. Alternatively, orthein ethanoic stain can also be used to watch the chromosome activity during mitosis clearly.

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Examiner Comments

This response contains descriptions of preparing a sample of tissue for electron microscopy - which is not on the specification at all.

If the name of the stain had been closer to 'orcein' than 'orthein' a mark could have been given for naming an appropriate stain, however, the root tip squash procedure has not been described at all in this response.

0/4

Question 2 (c)

This question required an application of knowledge concerning the cell cycle and analysis of a diagram depicting data. Although many correctly selected anaphase as the stage that would be most difficult to observe, many failed to provide a relevant explanation using the data from the diagram. There were many instances of correct answers being crossed out and replaced with an incorrect answer.

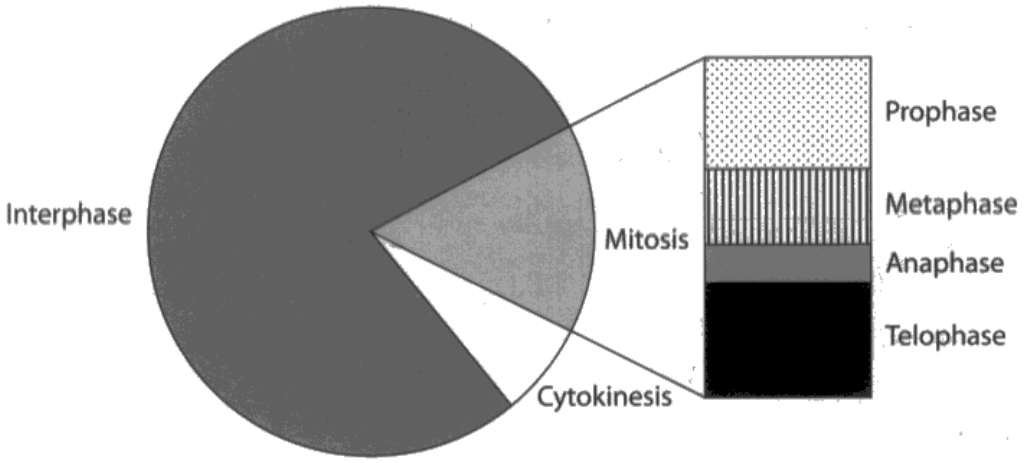
The most common incorrect response was cytokinesis, on the basis of the pie chart as a whole – although this was incorrect, credit would have been given if the reason given was that fewest cells were observed at this stage rather than penalise the candidate twice. Another reason for losing marks was suggesting that anaphase was a **short** or **fast** stage, rather than the **shortest** or **fastest** stage which would have gained a mark.

Some attempted to answer the question with no reference to the diagram, despite the instruction in the question, and came up with interphase, telophase or mitosis.

(c) A root tip squash was prepared and then observed using a microscope.

The number of cells at each stage of the cell cycle was counted.

The diagram below shows the proportion of cells observed at each stage of the cell cycle.



Using information in the diagram, suggest which stage of the cell cycle is the one least likely to be observed.

Give an explanation for your answer.

(3)

Anaphase is least likely to be observed since according to the diagram it can be seen that anaphase has the least proportion of cells observed which means the durng duration of this stage (anaphase) is also the smallest therefore it will be difficult to observerse anaphase as the duration is also less. And it is also difficult to distinguish metaphase and anaphase so some of the anaphase cells may be counted as metaphase and therefore anaphase is least likely to be observed.

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Examiner Comments

This response gains full marks for:

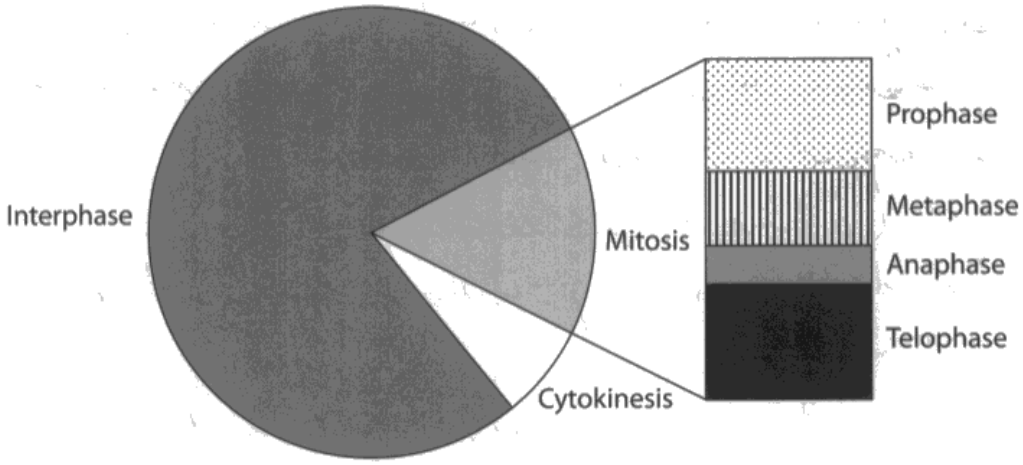
- anaphase
- least proportion of cells
- smallest duration

3/3

(c) A root tip squash was prepared and then observed using a microscope.

The number of cells at each stage of the cell cycle was counted.

The diagram below shows the proportion of cells observed at each stage of the cell cycle.



Using information in the diagram, suggest which stage of the cell cycle is the one least likely to be observed.

Give an explanation for your answer.

(3)

- Anaphase
- This is because it has the smallest proportion of cells observed.
- This means that the chance of finding out a cell in ~~of~~ anaphase is comparitively ~~of~~ less than that of finding out ~~other cells~~ cells in other stages of the cell cycle.

ResultsPlus
Examiner Comments

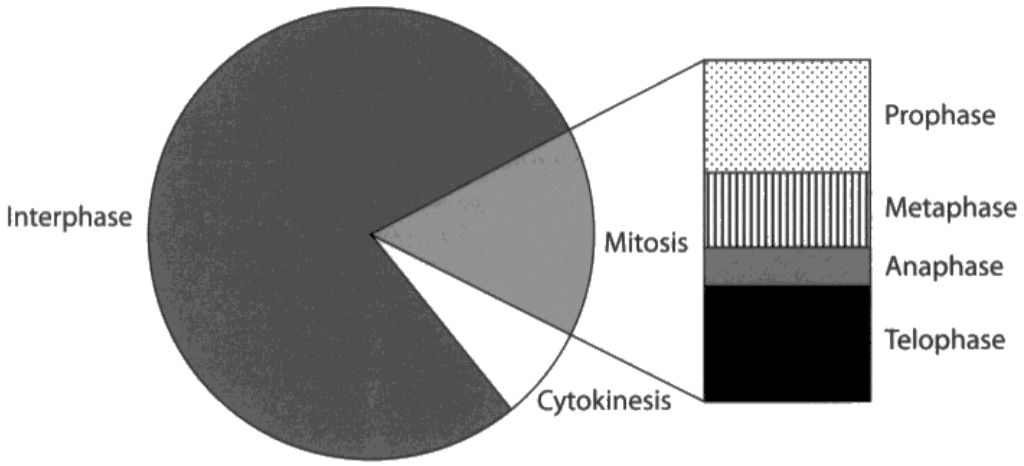
This response gained 2 marks - for anaphase and the 'smallest proportion of cells observed'.

2/3

(c) A root tip squash was prepared and then observed using a microscope.

The number of cells at each stage of the cell cycle was counted.

The diagram below shows the proportion of cells observed at each stage of the cell cycle.



Using information in the diagram, suggest which stage of the cell cycle is the one least likely to be observed.

Give an explanation for your answer.

(3)

Cytokinesis as the least number of cells are observed at that stage as it involves the cytoplasm dividing into 2 daughter cells which is difficult to observe.

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Examiner Comments

This was awarded one mark. Although cytokinesis is incorrect, the reason given is correct based on the pie chart alone.

1/3

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Examiner Tip

It is always important to give a reason for your answer as it may help gain marks even if the main part of the answer is not right.

Question 3 (a) (ii)

Many candidates failed to achieve full marks on this question due to a lack of detail and not linking the structural features described to how starch is suitable for its function. A description of the structure of starch was insufficient for this question – it had to be related to its function in the cell.

The first marking point on the mark scheme was for the idea of starch containing many glucose units. (Polysaccharide was not enough here as it had already been mentioned in the introduction to Q3).

There were many candidates that referred to starch as being large, insoluble or compact but failed to relate these points to the function of starch in plants.

Many referred to amylose having a spiral or helical structure, instead of coiled, although virtually all identified amylopectin as being branched. There were also a lot of answers that referred to these branches easily releasing energy, rather than in the context of glucose, some even referring to the 1-6 bond as a high energy bond!

Although many referred to starch being stored, there were fewer that referred to this in terms of energy storage. Despite many answers referring to amylopectin being branched, not many linked this to a rapid release of glucose when required.

(ii) Describe how the structure of starch is related to its function in plants.

(4)

Starch is a storage carbohydrate which is made of 2 components, Amylose & Amylopectin.
Amylose is a coiled & unbranched chain with 1,4 glycosidic bonds & Amylopectin is a branched chain 1,4 & 1,6 glycosidic bonds.
Starch is insoluble in water thus does not leave cells by diffusion & does not affect osmotic property of cell.
It is a compact molecule hence large ~~can be~~ amounts can be stored in small space.
It has large number of glucose molecules hence large amount of energy can be obtained for plant cell growth as in cell division.

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Examiner Comments

This gained full marks for:

- amylose being coiled and amylopectin branched
- starch being insoluble and having no osmotic effect on the cell
- starch being compact so that large amounts can be stored in a small space
- it contains a large number of glucose molecules

4/4

(ii) Describe how the structure of starch is related to its function in plants.

(4)

It is compact starch is compact therefore alot of glucose can be stored in a small space in starch

starch is large and therefore insoluble water and does not have any osmotic effect (doesn't draw water into the cells)

starch has ~~may~~ many side branches which can be rapidly hydrolized to provide energy for respiration when necessary in plants.

ResultsPlus

Examiner Comments

This gains marks for:

- compact so that a lot of glucose can be stored in small space
- large and insoluble, therefore no osmotic effect
- side branches for rapid hydrolysis

3/4

(ii) Describe how the structure of starch is related to its function in plants.

(4)

Starch is condenced which means that it takes up little storage space, thus more can be stored. It's also insduble, which means that it has no osmotic effect and can be stored. However, it's easily hydrolized when needed for energy.

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Examiner Comments

This response gains 2 marks - one for the idea of starch being 'condensed' so that it takes up less storage space and more can be stored, and one for being insoluble and having no osmotic effect.

No mark can be given for 'easily hydrolysed' without a reason - such as having branches.

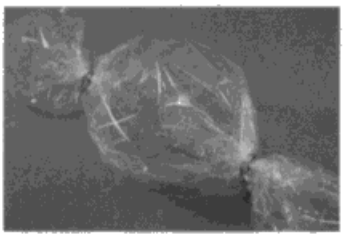
Question 3 (b)

Although this question was answered well by many candidates, there were many who described the bioplastic wrappers as being renewable or sustainable, instead of the material they were made from.

The starch produced by plants is renewable, as more can be produced by growing more plants. It is the resources used to produce the plastics that are either renewable or non-renewable, rather than the plastics themselves.

As this question was about the advantages of using bioplastics, reference to biodegradability was acceptable in this context.

(b) The photograph below shows a bioplastic wrapper made from starch.



Suggest the advantages of using bioplastic wrappers instead of plastic wrappers made from oil.

(3)

Bioplastic materials are made from biodegradable materials, and renewable materials. Plastic wrappers will not decompose ~~by~~ by the action of microbes, but bioplastic will. Plastic is made from non renewable materials, and bioplastic is, so can be made continuously, by using biological ~~matter~~ matter.

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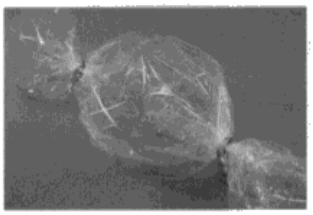
Examiner Comments

This is a good answer, clearly referring to the materials used to produce the bioplastic being renewable and biodegradable, whereas those used to make plastic are neither.

(b) The photograph below shows a bioplastic wrapper made from starch.



Suggest the advantages of using bioplastic wrappers instead of plastic wrappers made from oil.

(3)

bioplastics are sustainable, so can be regrown while plastics ~~can't~~ cannot be regrown.
bioplastic are a renewable source while plastics are non renewable.
bio plastics are biodegradable so can be broken down by decomposers while plastic from oil are not.

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Examiner Comments

This response gained one mark only for stating that bioplastics are biodegradable.

No marks can be given for stating that the bioplastic is renewable or can be regrown.

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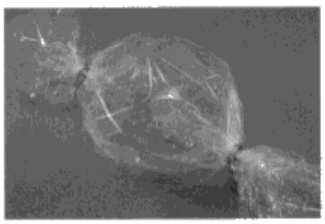
Examiner Tip

When it comes to sustainability, resources are renewable - e.g. more plants can be grown to produce starch, which is renewable and not the bioplastic.

(b) The photograph below shows a bioplastic wrapper made from starch.



Suggest the advantages of using bioplastic wrappers instead of plastic wrappers made from oil.

(3)

Bioplastic wrappers are renewable therefore it would not run out and it would be available for the next generations as well. instead of plastic wrappers that are non-renewable and they will eventually run out.

ResultsPlus
Examiner Comments

No marks can be given to answers that do refer to the renewability of the product instead of the resource.The bioplastic wrappers are **NOT** renewable.

Question 4 (a) (i)

There were some good answers easily gaining full marks. Many candidates described most of the key stages of the practical but lost marks as a consequence of lack of precise details concerning control of variables or how aseptic conditions are achieved. Others carelessly lost a mark for referring to **amount** rather than **volume** of extract.

It was common to see answers indicating that the zone of inhibition would be observed without reference to any measurement of the zone. Vague statements about repeating the experiment were also common. Many candidates gave details about the preparation of agar plates which were not required.

A significant number of candidates concentrated on the term **reliable** in the question and dedicated their answer to repeats, means, standard deviations etc. Also there were many responses that suggested that the plant materials should be of the same age, grown in the same conditions and were even from the same plants of the same species – despite the context of different species of plant.

Although it was clear that many candidates were familiar with the procedure, there were others who did not seem to understand how to approach the question. Some tried to culture the extracts on the agar whilst others mixed all 14 microorganisms in a single agar plate and described counting the numbers of dead different microorganisms.

*(a) (i) Suggest how this investigation could have been carried out to produce reliable data.

(5)

Using aseptic techniques you could sterilise petri dunes to prevent harmful bacteria growing or competing. Mix the bacterial microorganisms being investigated with an agar sowtion and evenly spread over the ~~petri dish~~ Petri dish. Let the agar set. Using the extracts - Basil, lemon balm, rosemary, thyme & clove in seperate petri duns ~~place~~ Place in the middle of agar sowtion. Put the lid on and incubate them for 24 hours at 25°c ~~degrees~~. Measure the zone of inhibition of each extract - clear zone. Repeat each extract 3 times to work out an average and keep incubation time and temperature constant throughout.

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Examiner Comments

This response gained 4 marks for correctly describing a relevant aseptic technique, correct incubation details, measuring the zone of inhibition and repeating for each extract to calculate a mean value.

Full marks could have been gained if there were details of how to prepare extracts of the same concentration for each plant or reference to the 14 different microorganisms used.

*(a) (i) Suggest how this investigation could have been carried out to produce reliable data.

(5)

Using aseptic techniques you could sterise petri dishes to prevent harmful bacteria growing or competing. Mix the bacterial microorganisms being investigated with an agar solution and evenly spread over the ~~petri dish~~ Petri dish. Let the agar set. Using the extracts - Basil, lemon balm, rosemary, thyme & clove in seperate petri duns ~~place~~ Place in the middle of agar solution. Put the lid on and incubate them for 24 hours at 25°c ~~degrees~~. Measure the zone of inhibition of each extract - clear zone. Repeat each extract 3 times to work out an average and keep incubation time and temperature constant throughout.

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Examiner Comments

This response provides a general description of how to test the antimicrobial properties of plant extracts without addressing the actual question.

It gained 3 marks for reference to use of a sterile spreader (aseptic technique), incubation details and measurement of a clear zone around the extract.

In order to gain full marks it was necessary to provide more relevant details for the investigation described in the question and not just a general method.

*(a) (i) Suggest how this investigation could have been carried out to produce reliable data.

(5)

Repeat the experment several times and get the avarge result, calculate stander deviation or range bar and added to the chart, repeat the experment using water as a solvent to be act as a control to know the effect of ethanol ~~in use~~. Use same concentrations and volumes for every extract do the experment in the same tempreature by using an incubator

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Examiner Comments

This response gained two marks for reference to making the data reliable, although there were no other details about how the investigation would be carried out.

Marks were gained for - repeats to get an average and use of same concentration for each extract.

Question 4 (a) (ii)

The majority of candidates scored 2 marks for this question, showing a clear understanding of the results presented in the graph.

The mark scheme focused on candidates identifying the most and the least effective extract, with credit given for correct calculation of the difference between the two - i.e. clove was 58% more effective than basil. Mistakes were occasionally made when interpreting the graph, with some candidates believing that the higher the value for effectiveness, the less effective the extract was at inhibiting the growth of bacteria.

(ii) Using the information in the graph, compare the effectiveness of these extracts.

(2)

The clove was the most effective as it had 64% of microorganisms inhibited and this was the highest. The least effective was the basil as it was the lowest percentage of microorganisms inhibited (6%). There was a percentage difference of 58% between the highest and lowest effective extract.

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Examiner Comments

A good clear answer explaining which extract was the most effective and which the least effective - there is also a correct, relevant manipulation of data to demonstrate that there is a 58% difference between the two.

(ii) Using the information in the graph, compare the effectiveness of these extracts.

(2)

Extract made from clove has the ~~highest~~ lowest effectiveness on percentage of microorganisms inhibited with a percentage of 64% the other extracts where more effective for basil for example was only 0% of microorganisms inhibited. Rosemary was also very effective with 14%. All other extracts ~~were~~ had a high effectiveness in comparison to extract made from clove.

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Examiner Comments

This candidate has crossed out the correct answer in the first line. It would appear that they have started by interpreting the graph correctly and then changed their mind and decided that 64% effectiveness refers to the bacteria, rather than the action of the extract against bacteria.

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Examiner Tip

Double check - especially if tempted to cross out the first answer that has been written. Check the information before any graph to make sure you know what it shows, then check the labels on the axes.

Question 4 (b)

This question asked candidates to compare the structures of a bacterial cell with a yeast cell, having been informed that yeasts are eukaryotic organisms. It was pleasing that many described similarities between the two cells as well as differences.

The similarities credited were those of possessing cell membranes and ribosomes. Credit was also given for description of both having a cell wall, although it was not expected that candidates would know that yeast possess a cell wall, or the differences in the structures of the cell walls. There were many detailed responses referring to the relative size of the ribosomes, as well as some demonstrating knowledge of differences in cell wall structure. However, there were also quite a few who believed that either yeast or bacteria do not possess a cell membrane.

The differences that were credited were correct references to membrane bound organelles – which was commonly seen, and differences in genetic material. Common errors here involved the confusion concerning type of DNA present – linear or circular, or mentioning one, but not the other.

A substantial number of candidates lost marks as they did not make direct comparisons, but instead wrote separate descriptions of yeast and bacteria. Although many described a type of feature with regard to one type of cell, they did not mention the other, which is necessary when the command word is '**compare'**, rather than '**describe'**.

(b) The microorganisms that the extracts were tested on included bacteria and yeasts. Yeasts are eukaryotic single-celled organisms.
sim+diff prokaryotic
Compare the structure of a bacterial cell with a yeast cell.

(4)

Eukaryotic yeast cell has larger ribosomes than the bacterial cell. The bacterial cell has smaller ribosomes. The yeast cell has membrane -bound organelles and the bacterial cell doesn't. The eukaryotic yeast cell has DNA held within a nucleus and in bacteria cell the DNA is free in the cytoplasm. The bacteria cell has plasmid rings and the yeast cell doesn't. Yeast cells also have linear DNA and the bacterial cell has circular DNA. Both have ribosomes present and a cell membrane.

(Total for Question 4 = 11 marks)

r

ResultsPlus
Examiner Comments

This response gained full marks. The similarities noted were the presence of cell membranes and ribosomes. The ribosome mark could also have been given for describing difference in size of ribosome. Another mark was given for the presence of membrane bound organelles in yeast but not bacteria.

Although no mark could be given for describing DNA as being 'free in the cytoplasm' in the bacteria, there is a mark that can be given for describing the difference in the type of DNA - linear in yeast and circular in bacteria.

(The mark for differences in genetic material could also have been given for stating that the DNA in the yeast is within a nucleus and that bacteria possess plasmids).

4/4

(ii) Using the information in the graph, compare the effectiveness of these extracts.

(2)

Extract made from clove has the lowest effectiveness on percentage of microorganisms inhibited with a percentage of 64% the other extracts where more effective for basil for example was only 8% of microorganisms inhibited. Rosemary was also very effective with 14%. All other extracts had a high effectiveness in comparison to extract made from clove.

ResultsPlus
Examiner Comments

This response gained 2 marks - one for correctly stating that only the yeast cells contain membrane bound organelles and one for describing the ribosomes in each type of cell.

No mark can be given for the references to cell walls and flagella only being in bacterial cells. Yeast also have a cell wall and not all bacteria have flagella.

2/4

Question 5 (a) (i)

Although most correctly named the independent variable as temperature, far fewer stated that '**length** of pollen tube' was the dependent variable with a significant number suggesting it was '**growth** of the pollen tube'.

A small minority transposed the dependent and independent variables and an even smaller minority quoted controlled variables from the stem of the question.

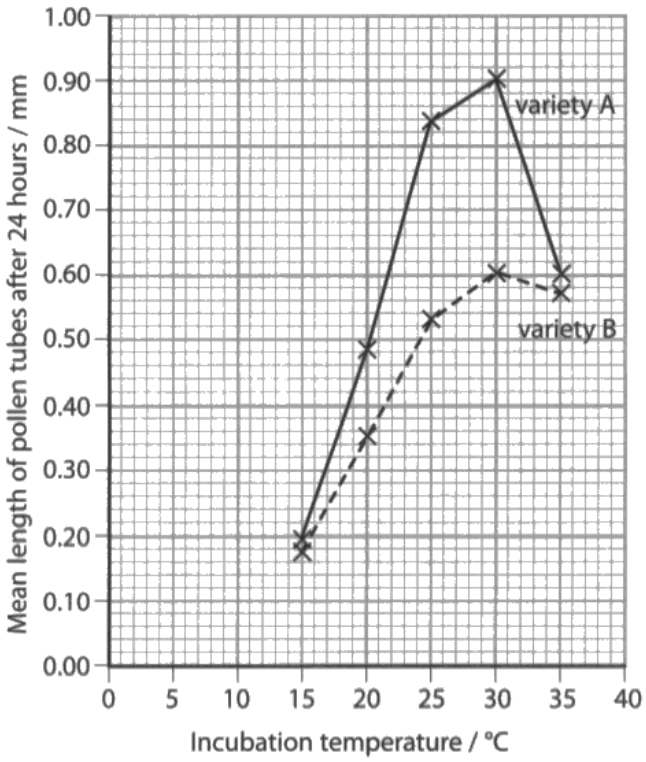
5 An investigation was carried out into the effect of temperature on pollen tube growth. Pollen grains from two different varieties of cotton plants were used, variety **A** and variety **B**.

Twenty pollen grains from variety **A** were placed in a solution of sucrose and incubated for 24 hours at 15 °C.

The lengths of the pollen tubes were then measured. This was repeated at four more temperatures.

The investigation was then repeated for pollen grains from variety **B**.

The results are shown in the graph below.



(a) (i) Name the independent and dependent variables in this investigation.

(2)

Independent variable ..... Temperature .....

Dependent variable ..... length of pollen tube .....

ResultsPlus
Examiner Comments

2/2 for correctly identifying the independent and dependent variables.

(a) (i) Name the independent and dependent variables in this investigation.

(2)

Independent variable: Temperature

Dependent variable: ~~Pollen tube length~~ Growth of Pollen tube

ResultsPlus
Examiner Comments

One mark for temperature as the independent variable.

No mark for pollen tube **growth** - must refer to **length** of pollen tube.

1/2

ResultsPlus
Examiner Tip

If you're going to cross out an answer and replace it - think carefully! The first answer that comes to mind is usually the right one.

It is more common to see correct answers crossed out than wrong ones!

(a) (i) Name the independent and dependent variables in this investigation.

(2)

Independent variable: Mean length of pollen tubes

Dependent variable: Incubation temperature

ResultsPlus
Examiner Comments

Typical error - muddling the independent and dependent variable.

ResultsPlus
Examiner Tip

Remember - the **dependent** variable **depends** on the **independent** variable.

The dependent variable should be plotted on the y axis (the vertical axis) and the independent variable on the x axis.

Question 5 (a) (ii)

The number of candidates that found the calculation of percentage change was surprisingly high.

Almost as common as the correct method was the error of dividing by 0.9 (the final value) instead of dividing by 0.2 (the original value). In this case only one mark could be awarded for selecting the correct values from the graph.

(ii) Calculate the percentage change in pollen tube length for variety **A** when the temperature was increased from 15°C to 30°C.

Show your working.

(3)

$\frac{0.90 - 0.20}{0.20} \times 100 = 350\%$

Answer 350 %

ResultsPlus
Examiner Comments

A good answer, showing the working out and the correct answer.

Gains 3/3

(ii) Calculate the percentage change in pollen tube length for variety **A** when the temperature was increased from 15°C to 30°C.

Show your working.

(3)

$30 - 15 = 15$

$0.90 - 0.20 = 0.70$

$\frac{0.70}{15} \times 100 = 4.66\dot{}$

$= 4.7\%$

Answer 4.7 %

ResultsPlus
Examiner Comments

This answer only gained one mark, for correctly selecting the figures 0.90 and 0.20.

The problem here is that this candidate has then divided the difference in length by the difference in temperature, and then multiplied the result by 100.

This is not a valid method for calculating the percentage change in length.

1/3

ResultsPlus
Examiner Tip

Showing the working out does allow some marks to be awarded even if the final answer is incorrect.

Remember to do this.

(ii) Calculate the percentage change in pollen tube length for variety **A** when the temperature was increased from 15°C to 30°C.

Show your working.

(3)

$$\frac{0.9 - 0.2}{0.9} * \cancel{100} \times 100$$

$$= 77.77 \simeq 77.8$$

Answer 77.8 %

ResultsPlus
Examiner Comments

This response gained 1 mark only - for selecting the figures 0.9 and 0.2 from the graph.

The error made here is a very common one - dividing the difference by the final value instead of the original value.

The question does ask for the percentage change in length as the temperature **increased** from 15°C to 30°C.

1/3

ResultsPlus
Examiner Tip

Underlining key words in the question is a good idea - here it has helped the candidate select figures for variety A.

It would have helped if they had also underlined the word **'increased'**.

(ii) Calculate the percentage change in pollen tube length for variety **A** when the temperature was increased from 15°C to 30°C.

Show your working.

(3)

$$\frac{0.90 \text{ mm} - 0.20 \text{ mm}}{0.20 \text{ mm}} \times 100\% = \cancel{350\%}$$

$$\frac{0.90 - 0.20}{0.90} \times 100\% = 70\%$$

Answer ~~350~~ 70 %

ResultsPlus
Examiner Comments

This candidate has crossed out the correct answer - which would have been worth 3/3 and replaced it with an answer only worth 1/3.

ResultsPlus
Examiner Tip

DO NOT cross out an answer without carefully considering why you would want to do that.

Question 5 (a) (iii)

The question asked candidates to use the information in the graph to **compare** the effect of temperature on the growth of pollen tubes of two varieties.

Many candidates concentrated too much on the details of the figures, quoting figures from the graph instead of looking for the general trends and making a comparison between A and B. Good responses referred to the greater effect of temperature on A at **all** temperatures, both sharing the same optimum temperature of 30°C and a positive correlation from 15°C to 30°C**.**

It is important that candidates appreciate that if two values are very close together, then it is likely that the difference is not significant. Very few noted that there was little difference between A and B at either 15°C or 35°C.

Poorly expressed answers were common with many giving the impression they thought that the same pollen tube was subjected to increasing temperatures – this suggested that they had not read the details of the investigation that were provided before the graph. Many answers also described a decrease in length at 25°C. Virtually all compared the fall after 30°C, often with manipulation of the data. Fewer than expected referred to an optimum temperature for the growth of pollen tubes.

(iii) Use the information in the graph to compare the effect of temperature on the growth of pollen tubes of variety **A** with variety **B**.

(3)

Mean length of pollen tubes of variety A are always greater than that of variety B at any given temperature. They both have greatest length at 30°C. As temperature increases upto 30°C, the mean length of pollen tube of both varieties increases. The mean length of pollen tubes of both varieties decreases with further increase in temperature after 30°C. At 30°C, the mean pollen tube length of variety A ~~is~~ is 0·30 mm greater ~~that~~ than that of variety B.

ResultsPlus
Examiner Comments

This response gained 3 marks - one for the mean length of pollen tubes of variety A always being greater than those of B, 'at any given temperature'; this point was very rarely seen.

The other marks gained were more commonly seen - reference to both having the greatest length pollen tubes at 30°C and both showing an increase in pollen tube length as temperature increased up to 30°C.

A very good answer - worth full marks.

3/3

(iii) Use the information in the graph to compare the effect of temperature on the growth of pollen tubes of variety **A** with variety **B**.

(3)

Variety A has the greatest mean length throughout the experiment in every effect of temperature. From temperature 15 to 20, ~~there~~ the mean growth is 0.29 in Variety A, and 0.18 in Variety B. the greatest increase in mean length is from ~~20 to~~ 20 to 25°C, ~~it be~~ in this temperature there is the highest growth in mean length for ~~A~~ variety A ~~d~~ and B.

ResultsPlus
Examiner Comments

This response gained 1 mark for referring to variety A having the greatest mean length (presumably of pollen tubes, but this has not been stated) at every temperature.

There are no marks that can be awarded for describing how much the pollen tubes increased in size between 15°C and 20°C. There had to be a description of an increase from 15°C to 30°C.

1/3

ResultsPlus
Examiner Tip

Look for the overall trend in graphs and tables before describing separate points within a range.

(iii) Use the information in the graph to compare the effect of temperature on the growth of pollen tubes of variety **A** with variety **B**.

(3)

The growth of the pollen tubes increases with an increase in temperature. At optimum temperatures; i.e: 25°C the rate of pollen tube growth is more in A than B, by a difference of 0.31.

ResultsPlus
Examiner Comments

Unfortunately, this response gains no marks. A general statement about growth of pollen tube increasing with an increase in temperature is not accurate, as the length is less at 35°C than at 30°C.

Although optimum temperature is described, it is incorrectly given as 25°C instead of 30°C.

0/3

ResultsPlus
Examiner Tip

Take care with precision of answers. A few more, precise details could have gained this candidate 2 marks instead of 0.

Question 5 (b)

Many candidates gained full marks here, although some thought that the pollen **grains** moved down the pollen tube and others thought the destination was an ovum.

Another common mistake was in referring to the style and a pathway, yet failing to describe the **digestion** of the pathway through the style.

(b) Describe the function of the pollen tube.

(2)

It digests the style by using enzymes so that a pathway is created to the ovule and it contains the generative nucleus and the tube nucleus. The enzymes break down the style by hydrolysis. Reaches the ovule so fertilization can take place.

ResultsPlus
Examiner Comments

This response covers all 3 possible marking points for full marks. It mentions digestion of the style, by enzymes, to produce a pathway through the style to the ovule and that the pollen tube contains the generative nucleus.

2/2

(b) Describe the function of the pollen tube.

(2)

pollen tube provide pathway for male gamete to embryo sac for fertilisation. Pollen tube allow to carry male gametes.

ResultsPlus
Examiner Comments

This response is not clearly worded, yet gains 2 marks - one for carrying male gametes and the other for correctly describing the destination of the pathway as being the embryo sac.

Note - there is no reference to the pathway being through the style, so the second marking point from the mark scheme would not have been awarded, however, the rest of the answer was worth 2 marks.

2/2

(b) Describe the function of the pollen tube.

(2)

allows the two male nuclei to travel down the style to fertilize the eggs down in the ovum of the plant.

ResultsPlus
Examiner Comments

One mark only for referring to the transport of male nuclei.

No mention of a **pathway** through the style.

No mark for incorrect reference to **ovum**.

ResultsPlus
Examiner Tip

Flowering plants contain **ovules**, whereas an **ovum** is a cell found in animals.

(b) Describe the function of the pollen tube.

(2)

Makes a pathway through the style to the ovary and delivers the pollen grain to the egg cell for fertilisation.

ResultsPlus
Examiner Comments

This gained one mark for making a pathway through the style. No mark for the destination being the ovary - it has to be to a specific location within the ovary.

This response also contains a commonly seen error, in referring to the pollen grains travelling through the pollen tube.

ResultsPlus
Examiner Tip

The pollen tube grows out of the pollen grain - it is not a channel through the style down which the pollen grain travels.

Question 5 (c)

This question asked for an explanation of the role of meiosis in the production of gametes. Although it was common to award a mark for knowing haploid nuclei were produced, the only other marking point regularly awarded was for a suitable reference to genetic variation. It was rare to see answers giving any correct descriptions of crossing over or independent assortment.

Full marks were achieved by some candidates who gave precise, detailed answers describing the roles of crossing over and independent assortment in generating new combinations of alleles. Imprecise writing lost the mark for many when it came to describing crossing over – there must be reference to chromatids (not chromosomes) and the idea of swapping sections of the chromatid.

(c) Pollen grains contain gametes.

Explain the role of meiosis in the production of gametes.

(3)

Meiosis produces haploid gametes. Thus the chromosomal number of a species is maintained when 2 gametes fuse forming a diploid zygote. Meiosis results in genetic variation due to independent assortment which results in a random arrangement of paternal and maternal chromosomes and crossing over where parts / segments of chromosomes are exchanged resulting in a new combination of alleles in gametes.

ResultsPlus
Examiner Comments

This is an excellent answer showing a thorough grasp of the purpose of meiosis. It covered 4 possible marking points on the mark scheme.

Marks could have been awarded for any of the following points:

- production of haploid gametes
- genetic variation caused by independent assortment
- accurate description of independent assortment
- reference to new combinations of alleles

Note - the description of crossing over would have to refer to chromatids and not chromosomes to gain that mark.

3/3

ResultsPlus
Examiner Tip

When describing crossing over - remember it is the chromatids which exchange sections, and not the chromosome.

(c) Pollen grains contain gametes.

Explain the role of meiosis in the production of gametes.

(3)

Meiosis produces genetically different cells through independant assortment and crossing over producing genetic variation in gametes. Moreover it produces haploid cells, which have half the number of chromosomes in a normal body cell so that when the gametes fuse a diploid zygote can be formed.

ResultsPlus

Examiner Comments

This response gains 2 marks - one for describing how meiosis gives rise to genetic variation and one for the production of haploid cells.

No details were provided for either independent assortment or crossing over.

2/3

Question 6 (a) (i)

Many candidates realised it was necessary to count the number of species but far fewer indicated the idea of a stated area. Some referred to counting the animals and plants and others implied the number of species in the entire Western Ghats would be counted.

The commonly-seen wording 'measure the species' didn't really convey the idea of counting and others described ways of estimating population. A common misconception was to count the number of species in a quadrat and then multiplying by the area of the Ghats, to calculate the total number of species in the Ghats.

With regard to genetic diversity, the most common misconception is that this is the number of *genes* rather than *alleles* in a gene pool.

There were also a few responses that referred to counting the number of 'Western Ghats', or calculating the population size of 'Ghats', having failed to read the introduction to the question and therefore being unaware that the Western Ghats are a range of mountains – as clearly shown in the photograph - and not a species of animal.

(a) (i) Describe how the biodiversity of the Western Ghats could be measured.

(2)

The species richness can be measured by using quadrats to ~~rate~~ find the amount of species in a particular area ~~and~~ and ~~also~~ along with random monitoring. The genetic diversity can be ~~found out by~~ measured by the range of alleles present in a population of a species by determining the size of gene pool.

ResultsPlus

Examiner Comments

Although there isn't specific reference to number of species, there is reference to the use of **quadrats** to find out the 'amount' of species in a **particular area.**

Description of measuring genetic diversity by determining the range of alleles in a population, or the size of the gene pool, was enough for a second mark.

Although this response could have been better worded, there is enough detail to appreciate that the candidate had a good understanding of biodiversity and award full marks.

2/2

(a) (i) Describe how the biodiversity of the Western Ghats could be measured.

(2)

You can measure the Specels ~~richness~~ richness by measuring how many diffrent types of a Specefic organism you can find in a given area (10,000 km / 1000 km). You could also measure the diffrent ~~types~~ types of organism (populations) in ~~the~~ ~~area~~ a given area.

ResultsPlus

Examiner Comments

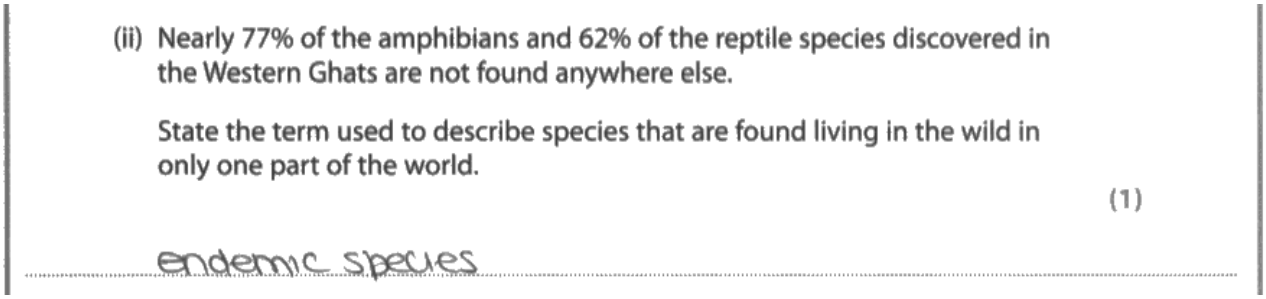
This gains 1 mark for describing the measurement of species richness (one aspect of biodiversity) within a given area - which was described.

However, there was no reference to number of species, but to the different types of a specific organism - which is almost population size, but not quite.

1/2

Question 6 (a) (ii)

It was pleasing to see that virtually all candidates correctly identified the answer as being endemic – although some referred to 'endangered' and 'mammals' was also given as an incorrect response.



(ii) Nearly 77% of the amphibians and 62% of the reptile species discovered in the Western Ghats are not found anywhere else.

State the term used to describe species that are found living in the wild in only one part of the world.

(1)

endemic species

ResultsPlus
Examiner Comments

A typical, correct answer.

Question 6 (b)

This question asked how captive breeding and reintroduction programmes could help conserve the lion-tailed macaque.

Pleasingly, a considerable number of candidates gained the maximum number of marks that were concerned with captive breeding programmes. Most, however, did not make any creditworthy statements about reintroduction programmes. One fairly common approach to this question, which failed to gain any credit, was to discuss natural selection and selecting those with advantageous alleles to mate. Another common line of thought was to describe how being in a zoo was better for the macaques than being in the wild with references to availability of food and medicine in the zoo but no predators.

Many answers correctly referred to: increase in population size, increasing genetic diversity, exchange of macaques or sperm between zoos and the use of stud books or DNA profiling. Where students failed to gain marks was for not describing preparation for reintroduction, such as reducing food supply; reintroduction was not summarised as 'when there are many macaques you release them into the wild again'.

Some also referred to zoos protecting from predators or hunters, but this would only have gained credit with reference to being released from captivity.

When discussing captive breeding, there were a significant number who made incorrect use of the word **species** and appeared to suggest that members of different species can be bred together.

There was evidence that some candidates were relying on learnt responses to previous questions concerning captive breeding, whereas those who had learnt the material well were able to score highly with well-structured detailed answers.

Suggest how these programmes can help to conserve the lion-tailed macaque.

(5)

Both of these programmes help species to increase population size, maintain genetic diversity and protect them from predators. For captive breeding, males are transferred between different zoos and stud books are used to select mates. Many females are fertilised using IVF or artificial insemination. This is to prevent inbreeding to maintain genetic diversity, as well as prevent genetic drifting. For reintroduction programme, the ~~organisms~~ wild behaviours are being reinforced in the organisms. e.g. less food given to encourage ~~hunting~~ hunting. Habitats are chosen and local people are educated or raised their awareness is ~~their awareness~~.

ResultsPlus

Examiner Comments

This is an excellent answer gaining full marks for discussing both captive breeding and reintroduction programmes.

Marks are awarded for:

- increase population size
- maintain genetic diversity
- transfer of males between zoos
- use of stud books to select mates
- prepared for reintroduction by feeding less to encourage hunting behaviour

5/5

Suggest how these programmes can help to conserve the lion-tailed macaque.

(5)

Captive breeding programmes increase their numbers. Captive breeding programmes also maintain genetic diversity and try to increase it. This could be done by preventing same partners from breeding alot, possibly by isolating partners. Select partner, which ensures different partners mate. This is done by IVF, or interzoo swapping of ~~animals~~ lion tailed macaque and gametes. Keeping stud books of breeding history help to achieve this. Zoos can also educate people on the importance of conserving and share success breeding stories. Captive breeding helps in scientific research to further develop information on ~~animals~~ lion-tailed macaque to increase breeding success. Reintroduction programmes release the lion-tailed macaque to the wild to maintain wild breeding population.

ResultsPlus

Examiner Comments

This is a good response gaining 4 marks for:

- increase numbers
- maintain genetic diversity
- inter-zoo swapping of lion-tailed macaques or gametes
- keeping stud books

No mark can be given for just describing reintroduction into the wild - details of the programme were required to suggest how it helps conserve the lion-tailed macaque.

4/5

Question 7 (a)

The vast majority of candidates correctly suggested either xylem or sclerenchyma. Incorrect responses varied between components of fibre, such as cellulose, lignified cellulose or cell walls, to stems or vascular bundles. It seemed that not all had taken into account the term **tissue** in the question, or indeed **plant**, as some suggested tissues that are found in animals, such as collagen.

(a) Suggest the type of tissue that forms fibres in flax plants. (1)

Cellulose cell wall.

ResultsPlus
Examiner Comments

Typical incorrect answer - cellulose cell wall, which is part of a cell and not a tissue.

(a) Suggest the type of tissue that forms fibres in flax plants. (1)

Collagen

ResultsPlus
Examiner Comments

There were some who did seem to be guessing, instead of applying their knowledge.

(a) Suggest the type of tissue that forms fibres in flax plants. (1)

Schlerenchyma

ResultsPlus
Examiner Comments

Most candidates suggested either xylem or sclerenchyma - the vast majority making a good effort at spelling a difficult word. This may not be spelt correctly, but couldn't be anything else but the right answer.

1/1

Question 7(b) (i)

The majority of candidates were able to correctly describe what is meant by the term **tensile strength**, but some failed to relate their answer to the fibre breaking while others referred to pressure being the cause of the fibres breaking.

This question demonstrated the need to be precise when writing descriptions, the tensile strength is a **measurement** and therefore candidates who wrote that it was the **ability** to withstand tension could not achieve the mark, nor could the few who described withstanding **pressure**.

Frequently, the term **tensile strength** was described using the word strength, e.g. 'the strength to resist breaking'.

Although, strictly speaking, tensile strength should be referred to in terms of a force, reference to mass was allowed, as many candidates would have carried out the associated core practical using slotted masses.

(b) Flax fibres have a high tensile strength that makes them useful for making cloth.

(i) Describe what is meant by the **tensile strength** of fibres.

(1)

Ability to withstand a force before the fibres snaps.

ResultsPlus
Examiner Comments

Typical incorrect reference to it being the 'ability' of something - in this case to withstand force.

0/1

This answer contains the elements of a correct answer, e.g. 'the force that a fibre can withstand before snapping'.

(b) Flax fibres have a high tensile strength that makes them useful for making cloth.

(i) Describe what is meant by the **tensile strength** of fibres.

(1)

The strength of the fibres until they break.

ResultsPlus
Examiner Comments

The tensile strength cannot be defined as the 'strength' of something.

0/1

(b) Flax fibres have a high tensile strength that makes them useful for making cloth.

(i) Describe what is meant by the **tensile strength** of fibres.

(1)

The amount of mass it can hold without breaking.

ResultsPlus
Examiner Comments

This definition was commonly seen and fits with the core practical - so although not a perfect description of tensile strength, is sufficient to gain the mark.

(b) Flax fibres have a high tensile strength that makes them useful for making cloth.

(i) Describe what is meant by the **tensile strength** of fibres.

(1)

Tensile strength is the amount of force that can be exerted on a fibre without it snapping.

ResultsPlus
Examiner Comments

A very good answer showing a good understanding of what is meant by tensile strength.

1/1

Question 7 (b) (ii)

There were many candidates who managed to achieve full marks for describing the role of calcium in pectin and its importance in the middle lamellae. There were very few who went on to relate this to the strength of the fibres, referring to the way in which the cells would be held together more firmly.

Candidates who didn't score well on this question referred to calcium as increasing the strength of cell walls, but not to it forming calcium pectate and strengthening the middle lamella.

(ii) The concentration of calcium ions affects the tensile strength of plant fibres.

Suggest why calcium ions affect the tensile strength of plant fibres.

(2)

This is because calcium ions are needed in the pectin to form calcium pectate called midle lamella which holds neighbouring plant cell togetres.

ResultsPlus
Examiner Comments

This gains the marks for reference to calcium pectate and middle lamellae - although, strictly speaking, the pectin is part of the composition of the middle lamellae, although their role is understood.

2/2

it breaks, has the highest tensile strength.

(ii) The concentration of calcium ions affects the tensile strength of plant fibres.

Suggest why calcium ions affect the tensile strength of plant fibres.

(2)

calcium ions are needed to make the calcium pectate which is involved in the formation of cell wall. Calcium pectate holds the microfibrils in the primary and secondary cell wall giving it a high tensile streugth.

ResultsPlus
Examiner Comments

An excellent answer - referring to the need for calcium ions to make calcium pectate that is needed to hold microfibrils together and increasing the tensile strength.

2/2

(ii) The concentration of calcium ions affects the tensile strength of plant fibres.

Suggest why calcium ions affect the tensile strength of plant fibres.

(2)

Because ~~fib~~ fibres contain calcium pectate when they are initially ~~made~~ made

ResultsPlus
Examiner Comments

This response gains just one mark for mentioning calcium pectate.

(ii) The concentration of calcium ions affects the tensile strength of plant fibres.

Suggest why calcium ions affect the tensile strength of plant fibres.

(2)

Calcium ion is ~~not~~ required in the plant cell wall. If calcium ions are less, the cell wall won't be strong and can't withstand pressure.

ResultsPlus
Examiner Comments

Although this candidate knows that calcium ions are required in the cell wall, there is not enough specific detail to gain any marks.

Question 7 (c) (i)

It is vital that any question based on data from an investigation is read carefully before being attempted – a common mistake made by many candidates is attempting to analyse data without reading about the actual investigation that produced that data. This certainly appeared to be the case with this question. A significant number of candidates assumed that the **control** had no mineral ions present despite being informed in the stem of the question that it was a group of plants grown in a standard mineral ion concentration.

Most candidates that did well gained marks for referring to the greatest diameter of fibre for the group with no mineral ions and the greatest cell wall for those with high mineral ion concentration – although many failed to gain these two marks for failing to refer to the **greatest** or **highest**.

Many failed to compare the other results in the table, or to realise what the standard deviation values were indicating – that there were no significant differences between them. For example, for fibre diameter, the values of 44.1 (SD 0.6) and 44.3 (SD 0.7) overlap showing no real difference between the control and high mineral ion concentration – and very few candidates spotted this. Candidates need to recognise that where two values are similar it may mean there is no significant difference between them and values for standard deviation can be used to check whether this is the case.

Common errors also included comparing the group with the greatest diameter or thickness with just the control group and ignoring the other group. There were also many attempts to utilise the data with little success in terms of manipulation, as most were simply quoting values. Simply describing the data in detail does not gain credit. Many erroneously tried to identify trends.

(i) Use the information in the table to describe the effects of mineral ions on the flax fibres.

(3)

The group with no mineral ions showed the highest diameter of fibre. (thus mineral ion) the control group and high mineral ion concentration Showed almost same results with over lapping error bars (no significant difference)
The seedling in group 2 showed the higher cell wall thickness as it was higher than of the control by 3dm. The cell wall thickness of the control and group 1 showed an overlapping error bars thus non significant difference. ~~as Mineral ion concentration has~~

ResultsPlus

Examiner Comments

This was a good answer gaining full marks.

Marks were awarded for:

- group with no mineral ions having fibres with highest diameter
- no significant difference between control group and high mineral ion group (despite mention of error bars instead of SDs)
- group 2 having higher cell wall thickness
- no significant difference (for cell wall thickness) between control group and group1

3/3

ResultsPlus
Examiner Tip

Make sure you refer to the data with care - the table was described as showing standard deviations, not error bars. Error bars are drawn on graphs, not shown in tables.

(i) Use the information in the table to describe the effects of mineral ions on the flax fibres.

(3)

- In a solution ~~no mineral~~ containing no mineral ions, the diameter of the fibre is on average 27.3 µm larger than in the control, as it lacks calcium ions which make it stiff. The cell wall thickness was 0.5µm bigger because of ~~loss~~ lack of Ca^{2+} ions.
- In a solution containing a high mineral ion concentration, the diameter of the fibre was 0.8µm larger than in the control, and the cell wall thickness was 3µm bigger than the control.

ResultsPlus
Examiner Comments

This answer just gained one mark for describing the values of the control group and the group 2 as being similar for diameter of fibre.

Better if there was reference to the diameter of fibre being largest with no mineral ions, instead of just larger.

1/3

(i) Use the information in the table to describe the effects of mineral ions on the flax fibres.

(3)

- Fibres with no mineral ions have a larger diameter 44.4 ± 0.9 and a smaller cell wall thickness of 6.1 ± 0.3 relative to the fibres placed in a high mineral ion concentration, which have a diameter of 44.3 ± 0.7 and cell wall thickness of 7.6 ± 0.5.

· The control group showed similar values to ~~the high~~ group 2 ~~at~~ 44.1 ± 0.6 diameter of fibre.

ResultsPlus

Examiner Comments

This response gains no marks. There is no reference to which group has the largest values for either cell wall thickness or fibre diameter. For each variable, there is just a comparison between the control group and the solutions which provided the higher value, with no mention of the third group.

0/3

Question 7 (c) (ii)

This question required reference to magnesium being required to produced chlorophyll and the inference that the group 2 plants would be provided with a higher concentration of magnesium. Some candidates misread the question and referred to group 1 instead.

Many responses made no specific reference to magnesium ions, just referring to the higher mineral ion concentration. Unfortunately, a few candidates thought chlorophyll was a mineral ion. Some answers were completely irrelevant and inaccurate in which the candidate tried to link chlorophyll content to fibre diameter.

The majority did gain one mark for referring to magnesium in the context of chlorophyll production, with better responses gaining full marks for also referring to the greater concentration of magnesium ions provided to plants in group 2.

(ii) It was found that the plants grown in group 2 contained more chlorophyll than the control group.

Suggest an explanation for the difference in chlorophyll content of these two groups.

(2)

Because group 2 had mineral ions concentration five times greater than the control. So group 2 had more ~~Mg~~ magnesium ions in it, ~~This~~ Magnesium ions form chlorophyll, so more magnesium ions it means more chlorophyll, that why plants grown in group 2 had more chlorophyll.

ResultsPlus
Examiner Comments

A good answer here, indicating a link between higher concentration of mineral ions with more magnesium and therefore more chlorophyll, as magnesium ions are needed to make chlorophyll.

(ii) It was found that the plants grown in group 2 contained more chlorophyll than the control group.

Suggest an explanation for the difference in chlorophyll content of these two groups.

(2)

Because since there is higher concentration of ~~are more~~ ^ ions present it means that, calcium ions concentration is higher and hence more chlorophyll is produced in these plants.

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Examiner Comments

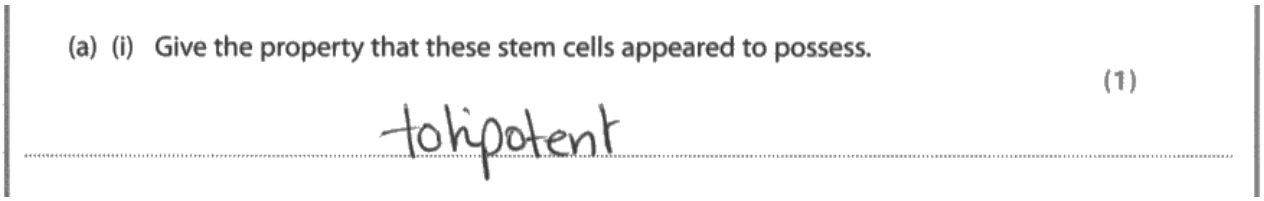
No marks can be given for this due to describing calcium instead of magnesium as needed to make chlorophyll.

0/2

Question 8 (a) (i)

In the introduction to this question, there were details of a scientific paper that contained claims that stem cells had been created from blood cells. This introduction included the claim that these stem cells 'could give rise to all cell types, including placental cells'. Question 8 (a)(i) then asked candidates to 'give the property that these stem cells appeared to possess' and the majority correctly identified this as totipotency. However, there were a few who had evidently skipped the introduction and described any property that stem cells possessed - which did not address the actual question that was asking about 'these stem cells' - the ones referred to within the introduction.

Candidates need to be encouraged to read all of the details in the exam question as this provides the context within which the questions are asked and failure to do so can cost candidates vital marks.

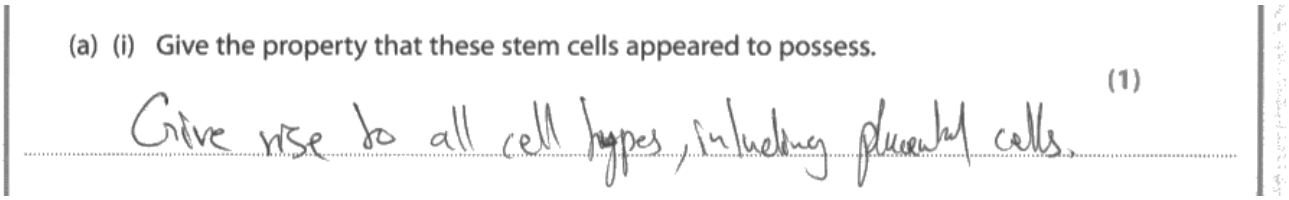

(a) (i) Give the property that these stem cells appeared to possess.

(1)

totipotent

ResultsPlus
Examiner Comments

Typical correct answer.


(a) (i) Give the property that these stem cells appeared to possess.

(1)

Give rise to all cell types, including placental cells.

ResultsPlus
Examiner Comments

Although this is something that these stem cells could do - this phrase is identical to the one in the introduction to the question and therefore does not gain a mark.

Candidates are expected to know that totipotent stem cells have the ability to 'give rise to all cell types, including placental cells'.

0/1

ResultsPlus
Examiner Tip

Make sure your answer isn't repeating what you've already been told in the introduction to the question.

Make sure you actually read the introduction before answering the question - it provides the context.

Question 8 (a) (ii)

The majority of candidates achieved full marks, many demonstrating that they had learnt how to describe the process by which cells become specialised well, although not all seemed to understand what they had written, as shown when transcription and translation were incorrectly described.

Some candidates tried to answer the question in terms of the totipotent stem cells, instead of focusing on the molecular processes that determine cell specialisation.

Although most gained marks for reference to a relevant stimulus and genes being activated (or switched on), fewer referred to the idea of permanent modification of the cell. Note that the correct context is the activation of genes, sometimes referred to as gene switching, which is why the phrase 'genes are switched on' can be credited, but 'genes being turned on' is not generally accepted.

(ii) Describe how cells become specialised.

(3)

Chemical Stimulus is given to unspecialised, some genes are switched on, others are switched off mRNA is made from active genes only, mRNA is transferred to ribosomes, ribosomes read mRNA and appropriate protein is made that can determine Structure and Function of cell. → permanently

ResultsPlus
Examiner Comments

This answer gained 3 marks, even though the wording was not as precise as it could have been.

Marks could have been given for any 3 of the following points made:

- chemical stimulus
- genes switched on
- mRNA made from active genes
- mRNA used to produce protein
- proteins permanently determines structure and function of cell

3/3

(ii) Describe how cells become specialised.

(3)

A chemical stimulus is given to undifferentiated cells. ~~So~~ Different genes become active at different times. mRNA only act on active genes. Proteins are produced on mRNA by translation. Proteins can permanently change the function of a cell.

ResultsPlus
Examiner Comments

This example gained 3 marks for:

- chemical stimulus
- genes activated
- protein permanently change function of cell

However, the descriptions given for transcription - 'mRNA only act on active genes' and translation - 'proteins are produced on mRNA by translation' are incorrect and would not have been awarded any marks.

3/3

(ii) Describe how cells become specialised.

(3)

Chemical stimulus activate the gene. The switched on gene is ~~trancribed~~ transcribed into mRNA. The mRNA is translated into protein. The cell function is determined.

ResultsPlus
Examiner Comments

Although very short, this answer concisely and accurately covers most of the marking points:

- chemical stimulus
- activates gene
- switched on gene transcribed to mRNA
- mRNA translated to protein

3/3

(ii) Describe how cells become specialised.

(3)

In the embryo, cells begin as totipotent cells with the ability to differentiate into any of the 216 types of cell needed to make up a whole person. As the blastocyst forms, cells on the outside change to become pluripotent, which means it can change into almost any cell type apart from special tissues such as placenta. Gradually cell determination begins to take place as the embryo grows and the cells become predestined for a particular function in the body.

ResultsPlus

Examiner Comments

This answer seems to be addressing a different question than the one asked.

It describes in general terms how the cells of an embryo become more specialised, with reference to the blastocyst.

0/3

Question 8 (a) (iii)

Unlike the previous question, which has been commonly asked, allowing candidates to memorise the mark scheme, this question on why cells cannot easily reverse the process of cell specialisation is not one that has been asked before. Many candidates found it difficult to suggest suitable answers. Many could only offer statements along the lines of "because specialised cells cannot divide".

Few candidates realised that whereas Q8(a)(ii) was about activated genes, this one was about the deactivated genes. Many also failed to correctly describe the change having been made to the cells being permanent or irreversible, even though they had frequently referred to that process in their answers to Q8(a)(ii).

This question did discriminate well, and only those candidates who demonstrated the ability to apply their understanding to the question were able to gain full marks.

(iii) Suggest why it is difficult for a specialised cell to be reprogrammed to become a stem cell.

(2)

The cell's structure may have been altered permant permanantly by protein and it may not divide continuously. Some genes in the cell is already switched off.

ResultsPlus

Examiner Comments

This is a good answer, referring to both the permanent alteration of the cell's structure and the fact that some genes were 'switched off'.

2/2

(iii) Suggest why it is difficult for a specialised cell to be reprogrammed to become a stem cell.

(2)

A specialised cell has differentiated and some genes have been switched off and others turned on so it is probably difficult to turn off the genes switched on and to bring the genes switched off to a neutral state – this makes it hard.

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Examiner Comments

This response gains one mark for correctly suggesting that it may be difficult to change the status of genes that have been 'switched off'.

1/2

Question 8 (b)

There have been questions in the past asking for a description of how scientists carry out a critical evaluation of evidence; this question asked candidates to describe how this process would have failed to support the conclusions described in a scientific paper. This question provided a different twist on the same area of the specification, yet one that caused problems for those who had learnt answers from mark schemes, and could not apply their knowledge to a different context.

It was pleasing to see many responses gaining full marks. However, a significant number of candidates did not seem to realise what is meant by the term **critical evaluation** and referred to problems with the experimental method or ethical issues. Many thought that the conclusions could not be supported due to poor experimental technique, with variables such as temperature not being controlled properly or that the original authors of the paper had not carried out replicates. Another frequently seen approach was to discuss the ethical issues of tests using animals, with many making reference to stress caused to the mice.

Many correctly referred to repeating the investigation but then jumped beyond the same results not being achieved and just stated that they came to different conclusions without realising that different scientists could come to different conclusions from the same set of results anyway.

Good answers correctly referred to peer review and also to scientists repeating the experiment and failing to get the same results**.**

(b) Critical evaluation of this paper by the scientific community did not fully support the conclusions. There were calls for the paper to be withdrawn.

Suggest how the process of critical evaluation failed to support the conclusions of this paper.

(3)

- Peer reviewed, and also the scientist repeated the experiment but did not found same /similar results and mean and thus the paper could not be published in scientific conferene or in scientif journals. Probably the results were not valid and thats why they did not agree to those conclusions

ResultsPlus

Examiner Comments

This is a good response clearly understanding the question.

Marks were given for;

- peer reviewed
- scientists repeated the experiment
- did not find the same/similar results

3/3

(b) Critical evaluation of this paper by the scientific community did not fully support the conclusions. There were calls for the paper to be withdrawn.

Suggest how the process of critical evaluation failed to support the conclusions of this paper.

(3)

publishing ~~a~~ scientific research on internet or in scientific journal and conference. peer reviewing, they view the method to check if it's appropriate, correct, accurate, and check the results to ~~the~~ see if they are sensible and reliable. The scientists / doctors then ~~re~~ repeat the investigation and collect evidence to modify, accept or reject the hypotheses or research.

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Examiner Comments

This response mostly describes the process of critical evaluation, instead of explaining why it failed to support the conclusions of the paper described in the question.

Marks were awarded for describing peer review and scientists repeating the investigation. There was no reference to different results having been achieved.

2/3

(b) Critical evaluation of this paper by the scientific community did not fully support the conclusions. There were calls for the paper to be withdrawn.

Suggest how the process of critical evaluation failed to support the conclusions of this paper.

(3)

the paper was peer reviewed by other scientists.
the other scientists applied their own knowlaage to the paper to support it or contradict it.
the scientific communnunity conducted their own researches to prove the paper wrong or right or to improve it or eventually it ~~must rea~~ research must have proven the ~~for~~ paper wrong

ResultsPlus
Examiner Comments

One mark only for peer reviewed.

The phrase 'the scientific community conducted their own researches' does not imply that the experiments were repeated by other scientists.

1/3

Question 8 (c)

This question asked for suggestions of two applications of the use of stem cell therapy, not two conditions that could be treated with stem cell therapy.

The emphasis here is on how the techniques are applied, in other words, something about how it works. Many candidates instead talked of the problems that might be solved using the techniques or the issues that may arise from the use of stem cells.

A large number of candidates just referred to the idea of a cure for a named disease - with many references to diabetes, multiple sclerosis and Parkinson's disease.

Common correct responses referred to production of organs for transplant. Although few referred to their application to the latest technique being developed, the 3-D printing of organs, the presence of this on the mark scheme was to credit those candidates who may have read about the research and correctly referred to it in this exam.

Few candidates were able to describe the use of stem cell therapy to provide cells or tissues to replace those lost to disease or injury.

(c) Stem cells are required for the development of medical therapies.

Suggest **two** applications of the use of stem cell therapy.

(2)

1 Repairing damaged tissues

2 Making organs ready for transplants.

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Examiner Comments

This response gained full marks for 'repairing damaged tissues' and producing 'organs for transplants'.

Although straightforward, this response was rarely seen.

2/2

(c) Stem cells are required for the development of medical therapies.

Suggest **two** applications of the use of stem cell therapy.

(2)

1 To make organs to be transplanted.

2 To cure ~~Neurodegenerative~~ neurodegenerative diseases such as parkinson's disease.

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Examiner Comments

This response gained one mark for 'make organs to be transplanted'.

No mark can be given for just describing a condition that could potentially be treated using stem cell therapy. The correct application in this case would be producing cells to replace damaged cells.

1/2

(c) Stem cells are required for the development of medical therapies.

Suggest **two** applications of the use of stem cell therapy.

(2)

1 Replace damaged cells

2 give rise to a new human being

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Examiner Comments

One mark can be given for 'replace damaged cells'. However, no credit can be given for using stem cells to 'give rise to a new human being'.

(c) Stem cells are required for the development of medical therapies.

Suggest **two** applications of the use of stem cell therapy.

(2)

1 Could lead to high risk of infection

2 High risk of cancerous cells and cause cancer.

High risk of tissue rejection.

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Examiner Comments

This response refers to potential risks involved in the use of stem cells as opposed to their applications.

0/2

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- learn how to use appropriate biological terminology, use glossaries online and in text books to learn the appropriate use of the subject specific vocabulary
- take care when analysing data from tables or graphs, read the question with care, especially if investigations have been described in detail
- when describing practical procedures, include enough precise details that someone else could follow your instructions to repeat the same experiment
- read all parts of the question and take into account the context as well as the command words used
- do not try to make the question fit an answer you have learnt from the mark scheme for a previous examination.

Grade Boundaries

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

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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