Pearson
Edexcel

Examiners' Report
June 2023

International Advanced Level Biology WBI12 01

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Introduction

This paper tested the knowledge, understanding and application of material from the topics ‘Cell structure, Reproduction and Development’ and ‘Plant Structure and Function, Biodiversity and Conservation'.

The range of questions provided ample opportunity for candidates to demonstrate their grasp of these topics and apply their knowledge to novel contexts.

The questions on this paper yielded a wide range of responses and some very good answers were seen. The paper appears to have worked very well with all questions achieving the full spread of marks.

Question 1 (a)(ii)

This question asked candidates to explain why their answer to Q01(a)(i) would be a different colour after one hour.

Most candidates knew the role of the xylem as transporting water or that it would absorb the stain with many candidates combining both aspects.

Some candidates knew the function of the xylem but did not apply this knowledge to the context of the stained water.

Some candidates thought the phloem would be stained instead of the xylem. Some candidates thought the stain was iodine and included the idea that the walls contained starch and would therefore be stained.

A small minority of responses referred to the idea of lateral transfer by either diffusion or osmosis.

(a) One hour after being placed into the beaker of stain, the student observed a cross-section from half way up the celery stem.

(i) Which of the following would be a different colour due to the presence of the stain?

(1)

☒ **A** W

☒ **B** X

☒ **C** Y

☒ **D** Z

(ii) Explain why, after one hour, this part of the stem would be a different colour.

(2)

Z is the xylem ~~vessel~~ which takes up water and transports it. So after an hour the xylem will have taken up the stain and therefore the colour would be different.

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Examiner Comments

This is an example of a response which scored two marks.

ResultsPlus
Examiner Tip

It is always a good idea to correctly name the structure you are referring to.

(a) One hour after being placed into the beaker of stain, the student observed a cross-section from half way up the celery stem.

(i) Which of the following would be a different colour due to the presence of the stain?

(1)

☒ **A** W

☒ **B** X

☒ **C** Y

☒ **D** Z

(ii) Explain why, after one hour, this part of the stem would be a different colour.

(2)

• because xylem carries ~~water~~ water travels through xylem

ResultsPlus
Examiner Comments

This is an example of the most common mistake made by candidates. Only mark point 2 was awarded.

Question 1 (b)(i)

This question asked candidates to name one organelle in a leaf cell that stores starch.

Candidates should be careful of how many answers they give. Where they wrote more than one organelle, only the first was marked.

Most candidates could correctly name an organelle, with amyloplast being the most common response. Amylopectin or amylose were common incorrect responses.

(b) Cells in the leaf contain organelles that store molecules of starch.

(i) Name **one** organelle in a leaf cell that stores starch.

(1)

Amyloplast

ResultsPlus
Examiner Comments

This response scored one mark.

(b) Cells in the leaf contain organelles that store molecules of starch.

(i) Name **one** organelle in a leaf cell that stores starch.

(1)

amylopectin

ResultsPlus
Examiner Comments

This is an example of the most common incorrect response.

Question 1 (b)(iii)

This question asked candidates to give one role of starch molecules in a leaf cell.

Most candidates were able to give a correct role.

Some candidates lost the mark as they referred to production of energy instead of release of energy, or used terminology that was inappropriate for IAL level.

(iii) Give **one** role of starch molecules in a leaf cell.

(1)

They provide food for the plant.

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Examiner Comments

Food was not specific enough at this level.

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Examiner Tip

Think about the terminology that would be appropriate for the question you are answering.

(iii) Give **one** role of starch molecules in a leaf cell.

(1)

starch is needed to be broken down into glucose, for aerobic respiration, for energy for growth

ResultsPlus
Examiner Comments

This is an example of a correct response.

Question 1 (c)

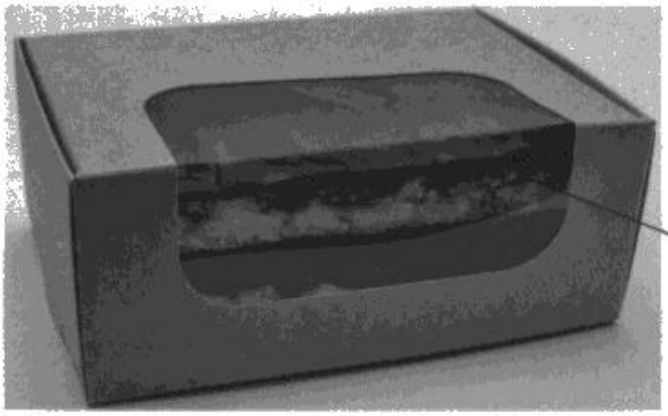
This question asked candidates to give a reason as to why the use of starch-based bio-plastic is more sustainable than oil-based plastic.

Candidates performed well on this question, with few incorrect responses seen.

Where a mark was not awarded, the most common reason was because candidates stated that the bio-plastic was more sustainable, without giving a reason.

(c) Transparent plastic film can be made from oil-based plastics or from starch.

The photograph shows transparent bio-plastic film, made from starch.



(Source: © Roman/Alamy Stock Photo)

Give **one** reason why the use of starch-based transparent bio-plastic film is more sustainable than the use of oil-based plastics.

(1)

Because its carbon-neutral and biodigradable.

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Examiner Comments

This response scored the mark for being carbon neutral. Although biodegradable would also have been a correct answer, only the first answer is marked when the question asks for one reason.

Question 2 (b)

This question asked candidates to explain how the phenotypes of an individual can show genetic linkage in the inheritance of two genes.

Many candidates could correctly state that the genes would be close together on the same chromosome. However fewer candidates could extend their answer to explain how the two genes have a higher chance of being inherited together.

A number of candidates referred to {dominant / recessive / codominant} genotypes and the effect on phenotypes, which was not creditworthy.

(b) Inheritance of different versions of these two genes shows genetic linkage.

Explain how the phenotypes of an individual can show genetic linkage in the inheritance of two genes.

(2)

genetic linkage often occurs when genes are located close to each other ~~of~~ on the chromosome. Often the two genes are codominant to each other and will express different phenotypes for ~~the~~ codominant allele combinations as well as for the rest of the combinations.

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Examiner Comments

This response gained marking point one.

(b) Inheritance of different versions of these two genes shows genetic linkage.

Explain how the phenotypes of an individual can show genetic linkage in the inheritance of two genes.

(2)

genetic linkage is when the alldes of 2 genes are found on the same chromosome, so they will always be inherited together,

eg :- A a ∴ AB will always be inherited together
B b and ab will always be inherited together.

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Examiner Comments

This response scored both marks.

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Examiner Tip

Sometimes a labelled diagram can add clarity to your answer.

Question 2 (c)

This question told candidates that one gene can give rise to more than one type of protein through post-transcriptional changes to mRNA. They were also given the information that one change to mRNA is the removal of introns.

This question was a very good differentiator and the full range of marks was seen.

Many candidates described the full splicing process, including the removal of introns, before explaining how exons are joined together and re-arranged.

A number of responses linked the role of spliceosomes to the removal of introns but did not include the role in joining exons. More candidates recognised that exons could be re-arranged than that some could be removed. The most commonly awarded mark was for translation of the mRNA and the formation of the polypeptide chain.

Some responses just gave a general description of the translation process, differentiation or epigenetic modification, which did not answer the question.

(c) One gene can give rise to more than one type of protein through post-transcriptional changes to the mRNA.

One of these changes is the removal of introns.

Explain how different proteins can be synthesised from this mRNA that has had introns removed.

(3)

Splicing of the premRNA, Remove introns
exon can be joined in different sequence / order / base sequence
giving different mRNA base sequence then this
mRNA different mRNA base sequence will be translated in
the ribosome, giving different poly peptide chain that
will result in different protein formed

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Examiner Comments

This is an example of a response which gained 3 marks for mark points 3, 4 and 5.

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Examiner Tip

Think about whether or not you need to repeat information you are given to answer the question.

(c) One gene can give rise to more than one type of protein through post-transcriptional changes to the mRNA.

One of these changes is the removal of introns.

Explain how different proteins can be synthesised from this mRNA that has had introns removed.

(3)

Active mRNA can undergo epigenetic modification before it is transcribed. This means that only active genes will be expressed, whilst the inactive genes ~~or~~ are silenced. ~~The~~ for instance, ~~chemical production of~~ DNA methylation and DNA acetylation will affect the binding of transcription factors. ~~and so will change these~~ The polypeptide will permanently change the structure and function of the cell

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Examiner Comments

This is an example of a response which did not answer the actual question being asked and therefore scored 0 marks.

Question 3 (a)

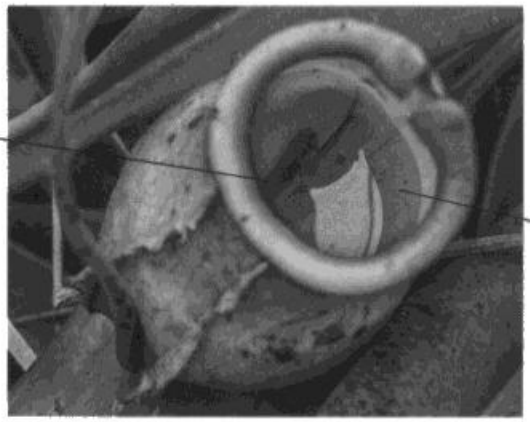
This question asked candidates to describe the role of the Golgi apparatus in the formation of extracellular enzymes.

Many responses started with irrelevant information regarding the role of the R.E.R.

Most candidates knew that the Golgi modified proteins and packaged into vesicles. The most common reason that limited candidates to one mark was just referring to proteins and not linking the processing to the formation of the enzyme or packaging the enzyme into a secretory vesicle.

3 The photograph shows a caterpillar and fluid inside a pitcher plant found on the island of Madagascar.

The fluid contains extracellular enzymes which are digesting the caterpillar.



(Source: © Martin Lindsay/Alamy Stock Photo)

(a) Describe the role of the Golgi apparatus in the formation of these extracellular enzymes.

(2)

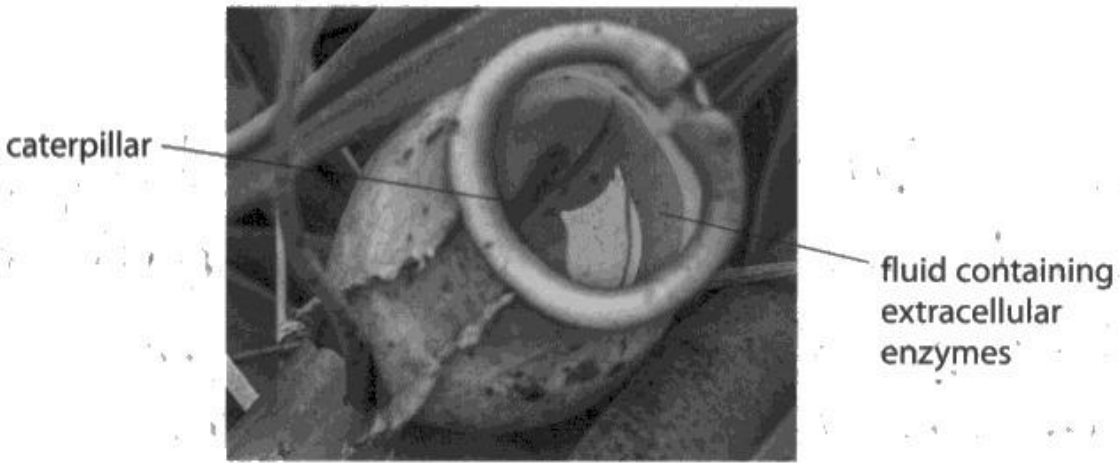
[Enzymes are proteins] Synthesised proteins from the RER are transported in vesicles to the golgi apparatus. ~~where~~ the proteins are then modified (to form enzymes) and repackaged in the golgi body and are transported in vesicles, ~~where the vesicles~~ to the cell membrane, where the vesicles fuse with the cell membrane and the competed enzyme is let out of the cell, by exocytosis.

ResultsPlus
Examiner Comments

This candidate correctly described the role of the Golgi apparatus in the formation of extracellular enzymes and scored both marks.

3 The photograph shows a caterpillar and fluid inside a pitcher plant found on the island of Madagascar.

The fluid contains extracellular enzymes which are digesting the caterpillar.



(Source: © Martin Lindsay/Alamy Stock Photo)

(a) Describe the role of the Golgi apparatus in the formation of these extracellular enzymes.

(2)

Golgi apparatus modifies these proteins and packs them into secretory vesicles to exit cell by exocytosis.

ResultsPlus
Examiner Comments

This is an example of a response which did not gain marking point 2, due to referring to proteins and not the enzymes in the question.

Question 3 (b)

This question asked candidates to give two ways in which a source of nitrogen is used by the pitcher plants.

Most candidates linked nitrogen to the formation of genetic material, gaining the marking point that was aimed at the lower level.

Fewer candidates gained the higher level mark. Some candidates just referred to production of proteins, without considering that the nitrogen source would be needed in formation of amino acids first.

(b) The digested insects are a source of nitrogen for the pitcher plant.

Give **two** ways in which this source of nitrogen is used by the pitcher plants.

(2)

1 Growth ends of a plant and growth in general

2 Synthesis of proteins.

ResultsPlus
Examiner Comments

This is an example of a response which did not consider the formation of amino acids.

(b) The digested insects are a source of nitrogen for the pitcher plant.

Give **two** ways in which this source of nitrogen is used by the pitcher plants.

(2)

1 It is used to make amino acids to be used in protein synthesis such as making enzymes

2 It is used to make DNA bases and RNA bases for making genetic material of the cell.

ResultsPlus
Examiner Comments

This is an example of a response which gained both marks.

Question 3 (c)(ii)

This questions asked candidates to explain two other conditions needed for optimum bacterial growth in the fluid of the pitcher plant.

Candidates had been given information that the fluid contained water and molecules from digested organisms, so responses referring to these were not creditworthy.

Many candidates didn't recognise the command word of explain and just stated conditions that were needed. Some candidates recognised that they needed more than just optimum temperature but tried to explain this by repeating the question, that it was needed for optimum bacterial growth.

High ability responses clearly linked temperature and/or pH and oxygen to enzyme reactions and respiration in the context of optimum bacterial growth.

(ii) The fluid of the pitcher plant contains water and molecules from digested organisms, which bacterial cells need for growth.

Explain **two** other conditions needed for optimum bacterial growth in the fluid of the pitcher plant.

(2)

1 optimum pH and temperature for optimum enzyme activity.

2 oxygen for aerobic respiration.

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Examiner Comments

This is a response which covered all three marking points, however only the first two answers were marked.

ResultsPlus
Examiner Tip

Take careful note of how many answers you should give as further answers will not be marked.

(ii) The fluid of the pitcher plant contains water and molecules from digested organisms, which bacterial cells need for growth.

Explain **two** other conditions needed for optimum bacterial growth in the fluid of the pitcher plant.

(2)

1 It needs optimum temperature

2 Optimum PH value.

ResultsPlus
Examiner Comments

This response shows the most common reason why candidates were not awarded marks. The candidate has not given an explanation.

ResultsPlus
Examiner Tip

Take careful note of the command word.

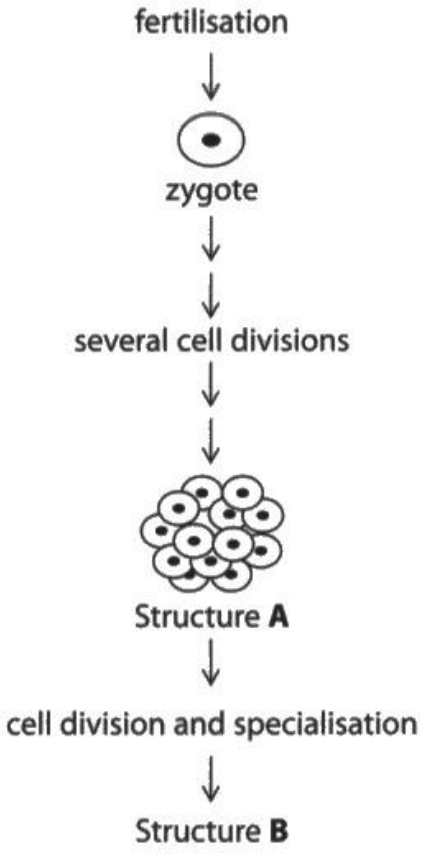
Question 4 (a)

This question asked candidates to describe the structure of a blastocyst.

Nearly all candidates knew that the blastocyst was a hollow ball of cells. Many candidates knew that there was an inner cell mass, however there was confusion in some responses as to whether the blastocyst cells were totipotent or pluripotent.

Candidates who drew a diagram to support their answer often scored highly as it illustrated the marking points.

4 The diagram shows some processes that occur after the fertilisation of an egg cell.

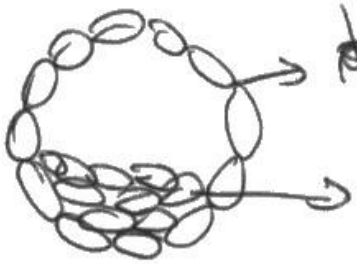


(a) Structure **B** is a blastocyst.

Describe the structure of a blastocyst.

(2)

- Inner cells ~~made~~ of pluripotent stem cells
- Outer cells of totipotent stem cells.
- Has inner mass.



totipotent stem cells (outer cells)

pluripotent stem cells (inner cells).

ResultsPlus
Examiner Comments

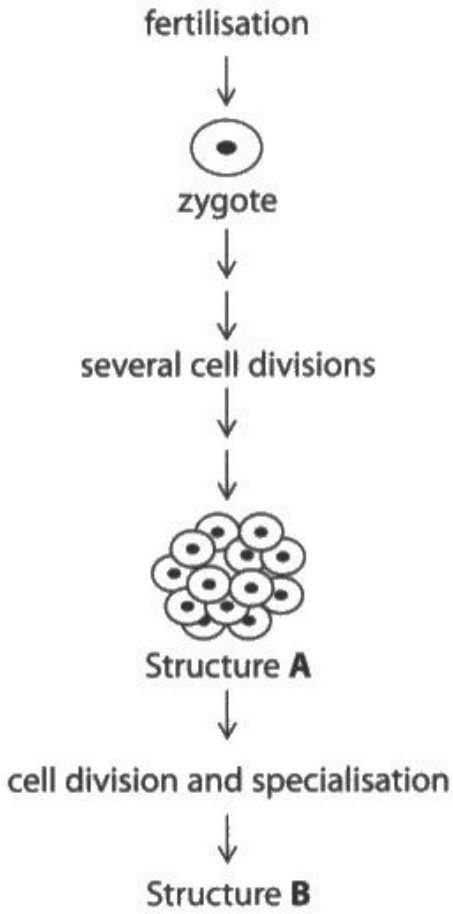
This response scored mark point 1 for an outer layer of cells, seen clearly on the diagram.

The response also gained mark point 2 for an inner cell mass or for containing pluripotent cells.

ResultsPlus
Examiner Tip

Sometimes labelled diagrams can add clarity to your answer.

4 The diagram shows some processes that occur after the fertilisation of an egg cell.



(a) Structure **B** is a blastocyst.

Describe the structure of a blastocyst.

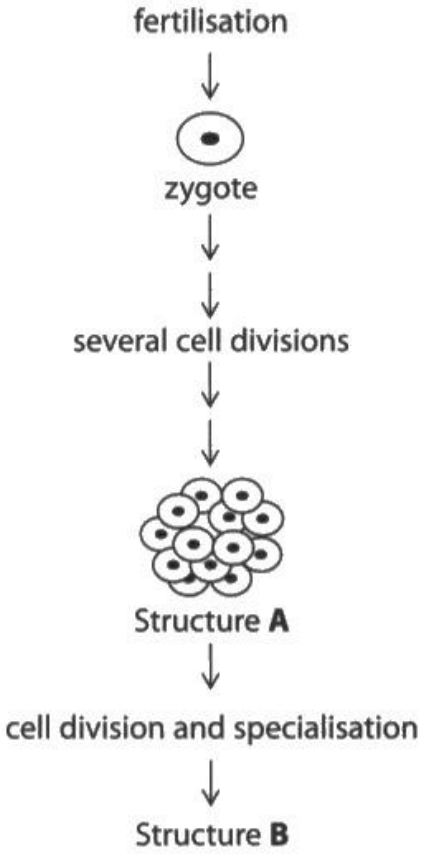
(2)

A hollowed out ball of cells

ResultsPlus
Examiner Comments

This is an example of a response which gained mark point 3.

4 The diagram shows some processes that occur after the fertilisation of an egg cell.



(a) Structure **B** is a blastocyst.

Describe the structure of a blastocyst.

(2)

A hollow ball of ~~totipote~~ pluripotent stem cells. It has a trophoblast which is the outer cell lining and an inner cell mass which is a source of pluripotent stem cells.

ResultsPlus
Examiner Comments

An excellent response which scored full marks.

Question 4 (b)

Candidates were given the mitotic index of a structure containing 60 cells. They were asked to calculate the number of cells in the structure that were in mitosis.

Most candidates were able to calculate the answer correctly.

However there were some candidates which calculated a number that was larger than the total number of cells in structure A.

(b) Structure **A** contained 60 cells.

The mitotic index of cells from structure **A** was calculated as 15%.

Calculate the number of cells in structure **A** which were in mitosis.

(1)

$\frac{15}{100} \times 60 = 9$ cells

Answer 9

ResultsPlus
Examiner Comments

An example of the correct calculation and answer for one mark.

(b) Structure **A** contained 60 cells.

The mitotic index of cells from structure **A** was calculated as 15%.

Calculate the number of cells in structure **A** which were in mitosis.

(1)

mitotic index = $\frac{\text{cell under mitosis}}{\text{total cell}}$

cell under mitosis = 60 × 15

= 900

Answer 900

ResultsPlus
Examiner Comments

This is an example of the most common incorrect response.

ResultsPlus
Examiner Tip

Look carefully at your answer – does it seem sensible based on the provided information?

Question 4 (c)

This question asked candidates to explain how histone modification and DNA methylation alter the activation of genes in the cells of structure B.

It proved to be a very good differentiator and the full range of marks was seen.

Some candidates misunderstood the question and gave responses relating to differentiation of cells.

Weaker responses tended to focus around aspects covered by marking point 6, without explaining how the genes were switched off.

Mid-level responses tended to also include a description of the methylation of DNA and either the methylation or acetylation of histones, without reference to mark points 2, 4 or 5. Some responses gave an explanation of only one process.

Higher level responses gave the additional detail in their explanations covered by mark points 2, 4 and 5.

(c) Structure **B** contains pluripotent stem cells.

Histone modification and DNA methylation are processes that occur when totipotent stem cells develop into pluripotent stem cells.

Explain how these two processes alter the activation of genes in the cells.

(5)

Histone modification, adds methyl group to lysine, increasing the positivity of histone so attraction forces between histone and DNA increase which converts heterochromatin into euchromatin, blocking the binding site of RNA polymerase so no transcription occurs causing gene silencing.
DNA methylation, adds a methyl group to cytosine in the DNA chain, ~~so~~ this is catalysed by ~~DNA~~ DNA methyl transferase, the addition of this methyl group alters the arrangement of DNA sequence and physically blocks the binding site of RNA polymerase so no~~t~~ transcription takes place which causes gene silencing as well.

ResultsPlus
Examiner Comments

This is an example of an excellent response which gained full marks, covering all six marking points.

(c) Structure **B** contains pluripotent stem cells.

Histone modification and DNA methylation are processes that occur when totipotent stem cells develop into pluripotent stem cells.

Explain how these two processes alter the activation of genes in the cells.

(5)

DNA methylation adds a methyl group to the gene which silences the gene. DNA demethylation removes this methyl group therefore activating the gene once again. For histone modification their is Acetylation, which activates the histone by adding a acetyl group to it. There is also methylation which just like DNA methylation, is the adding of a methyl group silencing the gene.

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Examiner Comments

This response scored 3 marks; mark points 1, 3 and 6. There was no detail as to how the addition of the methyl or acetyl groups would cause the silencing of the gene.

Question 5 (a)(ii)

This question was centred around the female humphead cichlid fish in the photograph.

Candidates were given the information that the female kept her fertilised egg cells in her mouth until they hatch. Candidates were asked to suggest why they had this behavioural adaptation.

Most candidates read the given information carefully and could recognise that this behavioural adaptation would protect the developing embryos from predators. Fewer candidates could extend their answers to encompass the effect that this protection would have on the survival chances of the young or the population size.

Some candidates did not read the given information carefully and thought males would fertilise the egg cells whilst they were in the mouth of the female.

(ii) **Suggest why the female humphead cichlids have this behavioural adaptation.**

Give a reason for your answer.

(2)

This may be to ensure that all the eggs hatch and are ~~To ensure~~ safe before hatching.
This is because the eggs dont stand a chance from other species of fish that might eat them

ResultsPlus
Examiner Comments

This is an example of a response which scored two marks.

(ii) Suggest why the female humphead cichlids have this behavioural adaptation.

Give a reason for your answer.

(2)

To protect their offspring from ~~lots~~ predators.

ResultsPlus
Examiner Comments

This is an example of the most common response, which gained mark point 2.

ResultsPlus
Examiner Tip

Look at the number of marks available and question if there is sufficient detail in your answer.

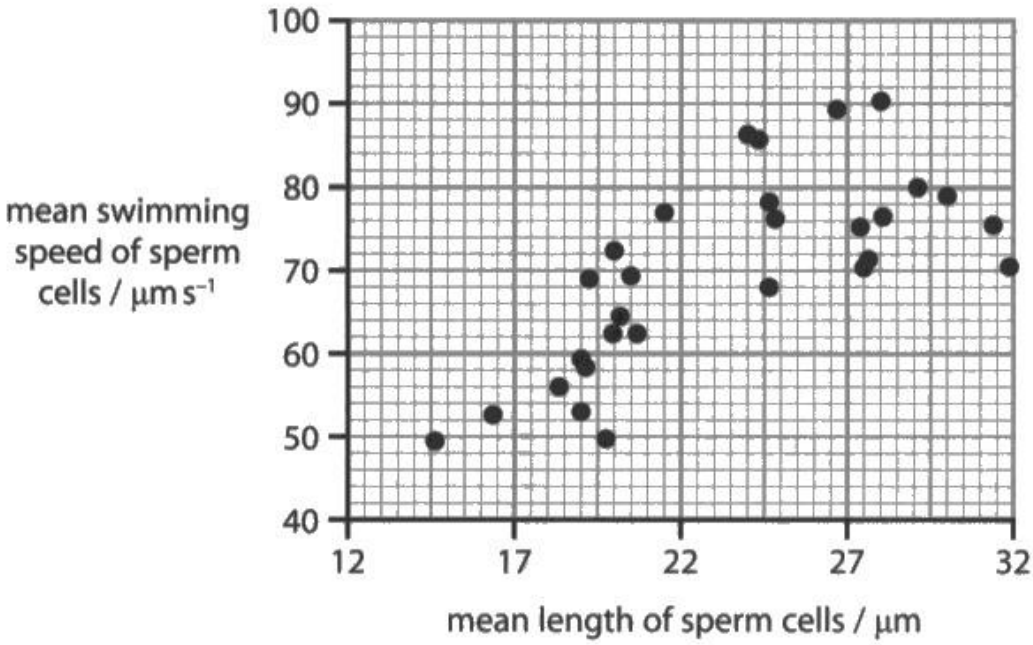
Question 5 (b)(i)

This question asked candidates to state the relationship shown between the mean length and swimming speed of the sperm cells shown in the graph.

Centres are reminded of the importance of the order of the variables in this type of question. Candidates should always infer that it is the independent variable (or variable on the x axis) causing the change in the dependent variable.

(b) The relationship between the length and swimming speed of the sperm cells of 30 cichlid species was investigated.

The graph shows the results of this investigation.



(i) State the relationship between the mean length and swimming speed of the sperm cells of these cichlid species.

(1)

When mean length increases, swimming speed increases.

ResultsPlus
Examiner Comments

This is an example of a correct response.

Question 5 (b)(iii)

Candidates were asked to suggest one advantage for a male cichlid of producing sperm cells with a faster swimming speed.

A significant number of responses centred around sperm being able to swim faster to an egg cell or faster fertilisation could occur without consideration of why this could be an advantage.

Higher level responses considered the competition with sperm cells from other male cichlids.

(iii) Suggest **one** advantage for a male cichlid of producing sperm cells with a faster swimming speed.

(1)

The sperm is more likely to fertilise the females egg before rival males

ResultsPlus
Examiner Comments

This candidate considered why a faster swimming speed could be advantageous to a male cichlid.

(iii) Suggest **one** advantage for a male cichlid of producing sperm cells with a faster swimming speed.

(1)

Increase the speed it could reach the egg cell.

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Examiner Comments

This is an example of a common response which did not fully answer the question.

(iii) Suggest **one** advantage for a male cichlid of producing sperm cells with a faster swimming speed.

(1)

So that the male chilid can fertalise the egg faster (as it's speed is quick), so if the female had other partners. There could be a chance to beat them by fertilising first so his genes will be passed

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Examiner Comments

This candidate clearly understood the advantage for a male cichlid of producing sperm cells with a faster swimming speed.

Question 5 (c)(ii)

This question provided candidates with a diagram of a sperm cell and a scale bar.

Candidates were expected to measure the length of the scale bar and perform a correct unit conversion.

It was surprising to see a significant minority of candidates attempting to measure the length of the sperm cell. However ecf was available for candidates who used this measurement and gave a correctly calculated answer to two significant figures.

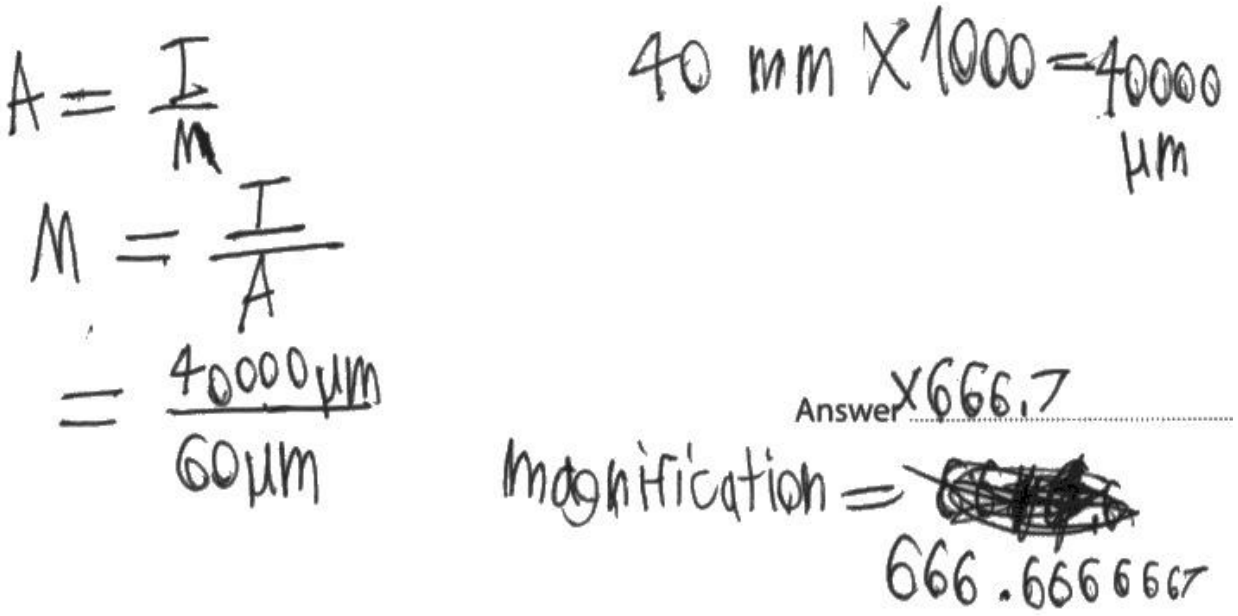
A significant number of candidates could not perform a unit conversion correctly. Centres are reminded of the importance of ensuring candidates can perform the mathematical aspects of the specification as a minimum of 8 marks are included on each AS paper that target mathematics at Level 2 or above.

Where candidates did perform the calculation correctly, it was disappointing that some did not take careful note of the requirement to give their answer to two significant figures.

(ii) Calculate the magnification of the sperm cell shown in the diagram.

Give your answer to **two** significant figures.

(2)



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Examiner Comments

This candidate has measured the scale bar and performed the correct calculation for one mark. However they did not present their answer in the required format and therefore were not awarded the second marking point.

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Examiner Tip

Always check to see if you have done everything you were asked to do.

(ii) Calculate the magnification of the sperm cell shown in the diagram.

Give your answer to **two** significant figures.

(2)

magnification = $\frac{\text{image}}{\text{actual}}$

$m = \frac{3.9 \times 1000}{60}$

$= \frac{3900}{60}$

$= \times 65$

Answer 65

ResultsPlus
Examiner Comments

This is an example of a response where an error in unit conversion resulted in the loss of a mark.

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Examiner Tip

It is important to always show your working, without this working this answer would have scored 0 marks.

(ii) Calculate the magnification of the sperm cell shown in the diagram.

Give your answer to **two** significant figures.

(2)

$$m = \frac{I}{A} = \frac{39000}{60} = 650$$

3.9 cm ⟶ 39000 μm

Answer 650

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Examiner Comments

A correct answer that scored full marks.

Question 5 (c)(iii)

This question told candidates that an acrosome was a specialised lysosome. Candidates were then asked to compare and contrast the structure and function of lysosomes and acrosomes.

A compare and contrast question requires candidates to give both similarities and differences.

It is important for centres to note that a paragraph of information about the structure and function of an acrosome followed by a paragraph of information about the structure and function of a lysosome is not the appropriate way to answer this type of question.

Candidates tended to focus more on the differences in the function in their responses, with the majority of answers gaining the third difference marking point. Vague responses referring to breaking through membranes of egg cells were not creditworthy. A small number of candidates thought lysosomes played a role in releasing energy for the movement of the sperm cells.

The most commonly awarded similarity was that they both contained digestive enzymes, although a small number of candidates thought that an acrosome and lysosome were enzymes which was incorrect.

The difference in shape was the most common aspect to gain the third mark.

Few candidates considered the second similarity or second difference in their answers.

(iii) Compare and contrast the structure and function of lysosomes and acrosomes.

(3)

↳ Lysosomes and acrosomes are are both types of digestive enzymes.

↳ However, acrosomes are found in the head of sperm and lysosomes are found in the cytoplasm of eukaryotic cells as organelles.

↳ Acrosomes contain the enzyme acrosin which digests/ breaks down the zona pellucida of an egg cell.

↳ Whereas lysosomes contain hydrolytic enzymes ~~the~~ that digest/break down waste products in cells/ unused organelles.

ResultsPlus
Examiner Comments

This response scored 2 marks for the bottom five lines. Comments about location did not answer the question. The statement that they were both digestive enzymes was incorrect.

(iii) Compare and contrast the structure and function of lysosomes and acrosomes.

Similarities

→ Both contain digestive enzymes

Differences

→ Lysosomes ~~Acro~~ Acrosomes contain specific extracellular enzymes ~~called~~ ~~acrosy~~ to in order to ~~re~~ digest the zona pellucida e to allow the sperm head to reach the egg cell's membrane while Lysosomes contain digestive enzymes that are mainly intracellular to digest old organelles and for cell ~~con~~ apoptosis.

→ Lysosomes are larger than acrosomes

(Total for Question 5 = 12 marks)

→ Lysosomes fuse with ~~bacteria~~ phagosomes during phagocytosis to kill bacteria

→ Lysosomes are present in somatic cells while ~~acro~~ acrosomes in gametes.

ResultsPlus
Examiner Comments

This is an example of a response which gained full marks and covered the first similarity and the bottom two differences.

ResultsPlus
Examiner Tip

It is a good idea to set your compare and contrast answer out with clear similarity and difference sections.

(iii) Compare and contrast the structure and function of lysosomes and acrosomes.

(3)

Lysosomes and acrosomes are both vesicles/organelles that contain digestive enzymes. However, lysosomes are involved in intracellular digestion, whereas acrosomes release acrosin for extracellular digestion. Lysosomes are round in shape, whereas acrosomes form an arch around the nucleus of the sperm. Lysosomes involved in phagocytosis/apoptosis, acrosomes are involved in digestion of zona pellucida.

ResultsPlus
Examiner Comments

This is an example of the most common type of 3 mark response.

ResultsPlus
Examiner Tip

Clear, comparative statements are a good idea for this type of command word.

Question 6 (a)(i)

This question asked candidates to explain how meiosis causes genetic variation in gametes.

It was clear that many candidates had a good understanding of this topic and many high quality explanations were seen.

However, lack of precision in the required terminology caused some candidates to lose marks. For example, referring to different gene combinations instead of allele combinations.

6 Meiosis results in genetic variation in gametes.

(a) (i) Explain how meiosis causes this genetic variation.

(3)

Through crossing over in prophase 1 where ~~chromosor~~ chromatids join, break and reconnect to non-sister chromatids at chiasmata, forming recombinant chromosomes with new combination of alleles forming non-identical gametes. Through random assortment of chromosomes in metaphase 1; where homologous chromosomes randomly align at the center of the cell and are separated to form non-identical ~~allel~~ gametes with a different combination of chromosomes.

ResultsPlus
Examiner Comments

This candidate gave a full explanation with appropriate terminology and gained full marks.

Question 6 (a)(ii)

This question asked candidates to give two differences in the arrangement of the DNA in a cell at the beginning of interphase and at the end of prophase.

Candidates needed to refer to both stages in their response, it was not sufficient to infer a difference in a statement covering just one stage.

General descriptions of interphase and prophase were not creditworthy.

Most candidates knew that the DNA was condensed at the end of prophase whereas it was not at the beginning of interphase.

A significant number of candidates referred to the presence or absence of the nucleus or nuclear membrane but didn't relate this to the arrangement of the DNA.

(ii) Give **two** differences in the arrangement of the DNA in a cell at the beginning of interphase and at the end of prophase I.

(2)

1 Chromosomes are condensed at the end of prophase I - they are not at the beginning of interphase.

2 The DNA content of a cell in prophase I is double the DNA content of a cell in the beginning of interphase.

ResultsPlus
Examiner Comments

Two clear and concise differences gained both marking points.

(ii) Give **two** differences in the arrangement of the DNA in a cell at the beginning of interphase and at the end of prophase I.

(2)

1 At the beginning of interphase DNA is found as long strands of chromatin whilst at the end of prophase I it is a condensed chromosome.

2 At the beginning the DNA is enclosed within the nuclear envelope however at the end of prophase I the nuclear envelope breaks down and the DNA is free floating in the cell.

ResultsPlus
Examiner Comments

A 2 mark response using correct terminology such as chromatin.

Question 6 (c)

This was the first level-based question on the paper.

Candidates were provided with a range of information regarding plant strategies to analyse, and they were expected to use this information to support their answer.

Many responses were in the order of the bullet points of information under the flower diagram, however there were a significant number of responses which did not have any structure. Such responses often did not make it clear which plant or strategy they were referring to. Centres should encourage their candidates to make a plan before writing their answers.

Level 1 responses tended to centre around the effect that the strategies would have on genetic diversity. Some candidates were confused as to the difference between genetic diversity, biodiversity and gene pool.

Level 2 responses tended to give a limited discussion on the advantages and disadvantages of the given strategies, whereas Level 3 responses used appropriate knowledge and understanding to add detail to their discussion.

Higher level responses appreciated that the dandelion egg cells would not be genetically identical.

The weakest area centred around the disadvantages of preventing self-fertilisation. Many candidates thought that the chemicals released by the orchid would damage the environment or deter pollinators.

Discuss the advantages and disadvantages of the strategies shown by these plants.

(6)

Advantages of cross-fertilisation is that it leads to higher genetic variation so more chances of survival. Date palm plants having only female part of flower attracts insects (bees etc) so this increases chances of fertilisation. Date palm plant having only male part allow the pollen to get carried away by wind as they are light and not covered to increase chances of fertilisation. The disadvantages is that it is

ResultsPlus
Examiner Comments

This response was limited to Level 1 as it only considered advantages of the date palm plant strategy.

Discuss the advantages and disadvantages of the strategies shown by these plants.

(6)

→Advantages shown by Date palm plants:

- By having seperate male & female flowers, date palm plants ensure that self-fertilization does not occur. This prevents the negative effects of inbreeding depression, which can lead to reduced genetic ~~thes~~ diversity & fitness in offspring.

→ Disadvantages shown by Date palm plants:

- Date palm plants rely on cross-pollination for successful fertilization.
- If suitable pollinators are not available, it may result in reduced seed production & reproductive success.

ResultsPlus
Examiner Comments

This is an example of a lower Level 2 response, showing a discussion of both advantages and disadvantages of the plant strategies to prevent self-fertilisation. As the candidate did not consider the strategies of the fireweed or dandelion plants they could not access Level 3.

ResultsPlus
Examiner Tip

It is a good idea to think about how you are going to structure your answer before you start writing.

Discuss the advantages and disadvantages of the strategies shown by these plants.

Preventing self fertilisation results in higher species genetic diversity, & greater alleles in the (6) gene pool which is good as that would mean the species is better suited to surive a disease for example so has selection advantage. As date palm plants only have male or female flowers, self pollination can't happen ∴ increased chances of crossed pollination & ∴ greater genetic diversity However in seasons with forexample less insects or less wind, cross pollination can't happen & new flowers aren't grown so the number of organisms would decrease. increasing extinction risk Orchids releasing chemicals to preventing self fertilisation is a physiological adaptation, which could again increas cross ploination chances ∴ greater genetic diversity but for same reason as date palms could also ↓ # of offsprings produced at certain times. Fireweed self fertilising is (if cross fertilisation hasn't occured) is advantageous as cross-fertilisation increasing genetic diversity is still prioritised & in times of no wind or insects, pollination (self) still takes place so risk of extinction is reduced. However self pollination ↓ genetic diversity. Unfertilised dangelion plant egg all developing into a seed is advantageous as plant can still be produced when cross pollination isn't likely. However, this ↓ genetic diversity.

(Total for Question 6 = 12 marks)

ResultsPlus
Examiner Comments

This is an example of a Level 3 response which gave a detailed discussion of the advantages and disadvantages of the strategies shown by the plants.

Question 7 (b)(i)

This question asked candidates to state what is mean by the term tissue.

Most candidates could give a correct answer to gain the mark. An improvement in the quality of answers was seen compared to previous exam series.

(b) The corpse lily plant is unusual because none of its cells contains chloroplasts.

Most of the corpse lily plant grows inside the tissues of a rainforest vine plant, including inside the tissues involved in the translocation of organic solutes.

Only the corpse lily flower can be seen growing outside of the vine.

The corpse lily plant obtains organic solutes such as sucrose from one of the tissues in the vine plant.

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

(1)

a group of similar cells working together to perform a specific function

ResultsPlus
Examiner Comments

This is an example of a correct answer.

Question 7 (b)(ii)

Candidates had been given information about the corpse lily plant and were expected to apply their knowledge to the given context.

The majority of candidates recognised the role of the phloem in translocation and were awarded marking point 1, although very few candidates were able to correctly use all of the information given in the stem of the question to gain marking point 2.

Most candidates were able to consider the role of diffusion / active transport or the movement of organic solutes through the plasmodesmata, to gain marking point 3.

Some candidates gave irrelevant information on the role of xylem.

(ii) Suggest how the corpse lily plant obtains organic solutes, such as sucrose, from one of the tissues in the vine plant.

(3)

By translocation and by phloem where sucrose is dissolved in water and transported in both directions from source to sink

ResultsPlus
Examiner Comments

This candidate correctly identified the tissue and was awarded the first marking point.

(ii) Suggest how the corpse lily plant obtains organic solutes, such as sucrose, from one of the tissues in the vine plant.

(3)

They can be obtained by diffusion from high concentration in the vine plant to low concentration in the lily plant as they are grown inside the tissues of vine plants.

ResultsPlus
Examiner Comments

This candidate did not identify the type of tissue that the corpse lily plant was growing in, so could only access the third marking point.

(ii) Suggest how the corpse lily plant obtains organic solutes, such as sucrose, from one of the tissues in the vine plant.

(3)

By growing in the ~~phloem~~ phloem, where the ~~the~~ ~~phloem~~ ~~phloem~~ transports sucrose and amino acids, so the oragnic solutes will diffuse into the corpse lily plant, therefore, they can use the nutrients supplied for growth.

ResultsPlus
Examiner Comments

This response scored full marks.

Question 7 (c)(i)

This question gave candidates details of an investigation.

Candidates were asked to explain the purpose of the gel used in the different treatments in the investigation.

Most candidates were able to gain the first marking point about the experimental function of the gel used. Higher level answers also considered the role of the gel as a control and its importance for a valid comparison.

A common error was not understanding the difference between a control and a controlled variable.

(c) The wound healing properties of an extract made from corpse lily plants were investigated.

Treatments were tested on four groups of six rats with identical skin wounds.

The treatments were applied to the wounds twice a day.

The time taken for the wounds to heal was recorded.

The table shows the treatment applied to each group and the results of this investigation.

Rat group	Treatment	Mean healing time / days	Standard deviation
1	gel + no extract	21.67	±0.48
2	gel + 5% extract	15.83	±0.33
3	gel + 10% extract	14.67	±0.56
4	gel + current wound treatment	12.33	±0.31

(i) Explain the purpose of the gel used in these treatments.

(3)

the gel is used as a solvent for the extract so that ~~it~~ ~~is~~ it is more diluted and the dose can be determined. water is less viscous so it would not stay on the ~~wout~~ would so gel is used as a medium for the ~~e~~ extract

ResultsPlus
Examiner Comments

This response scored 1 mark for the first marking point.

(c) The wound healing properties of an extract made from corpse lily plants were investigated.

Treatments were tested on four groups of six rats with identical skin wounds.

The treatments were applied to the wounds twice a day.

The time taken for the wounds to heal was recorded.

The table shows the treatment applied to each group and the results of this investigation.

Rat group	Treatment	Mean healing time / days	Standard deviation
1	gel + no extract	21.67	±0.48
2	gel + 5% extract	15.5 15.83 16.16	±0.33
3	gel + 10% extract	14.11 14.67 15.23	±0.56
4	gel + current wound treatment	12.02 12.33 1.64	±0.31

(i) Explain the purpose of the gel used in these treatments.

(3)

the gell is used as control between the 3 different extracts gell would help extract adherie better to the wounds. used as a solvent to dissolve extract

ResultsPlus
Examiner Comments

This response gained the first two marking points but didn't explain why a control would be used.

(c) The wound healing properties of an extract made from corpse lily plants were investigated.

Treatments were tested on four groups of six rats with identical skin wounds.

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3	gel + 10% extract	14.67	±0.56
4	gel + current wound treatment	12.33	±0.31

(i) Explain the purpose of the gel used in these treatments.

(3)

- Gel is a control
- So that the investigation is valid
- And the ~~concentrati~~ values for extract concentration can be compared
- Gel is also used so that extract sticks to the skin and shows its effect.

ResultsPlus
Examiner Comments

This response gained all three marking points.

Question 7 (c)(ii)

This question asked candidates to comment on the results of the investigation shown in the table.

This question proved to be challenging to many candidates on many levels. Many candidates did not take careful note of the command word and instead offered simple descriptions of the data.

More able candidates gained 2-3 marks from the first three marking points by giving suitable conclusions from the raw data.

Centres are encouraged to teach candidates about how standard deviation (SD) is a measure of dispersion, including how to use it in making conclusions. Some candidates thought that the presence of means and SD meant that the investigation was reliable. Many candidates just gave information on the sizes of the SD or linked it to accuracy and not repeatability / reliability or validity.

Higher level responses recognised that there was no overlapping data linking it to a significant difference between the different treatments. These responses also considered the role of sample size in evaluating experimental designs.

(ii) Comment on the results of this investigation.

(4)

Increasing of extract, will ~~increa~~ decrease the mean healing time per day. Gel with current wound treatment is the most effective method of treatment. With 12.33 of healing/day. Gel with no extract is the lowest effective treatment, lowest value of mean healing time/day, only 21.67. Present of information of standard deviation, no overlapping, so a significant differences between the data.

ResultsPlus
Examiner Comments

This response has been awarded the first four marking points.

(ii) Comment on the results of this investigation.

(4)

Increasing the percentage of the extract (by 5%) showed a ~~stigh~~ showed a slight decrease in mean healing time of the rat wounds by by (1.16 days).
The current wound treatment is the most effective as it showed the least mean healing time (17.33 days)
While no extract was least effective at treating the wounds
The results of different treatments do not overlap, showing validity of the results
Current wound treatment is most effective and most predictible form of treatment due to the low standard deviation (±0.31)

ResultsPlus
Examiner Comments

This is an example of a response which gained the first four marking points.

Question 8 (a)

This question gave candidates a photograph of a snow leopard. Candidates were required to use the photograph to give one reason for a named anatomical adaptation that enable the snow leopard to occupy its niche.

The most commonly given adaptation was thick fur with the reason of preventing heat energy loss. Some candidates gave fur unqualified as the adaption but since all mammals have fur this was insufficient.

Another frequently seen response recognised that the colour and pattern of the fur seen in the photograph would enable the snow leopard to be camouflaged in the environment.

8 Snow leopards (*Panthera uncia*) live in mountainous regions in Asia.

The photograph shows a snow leopard on a snow-covered mountain.

(Source: © Natural Visions/Alamy Stock Photo)

(a) Give **one** reason for a named anatomical adaptation of this snow leopard that enables it to occupy its niche.

Use the information in the photograph to support your answer.

(1)

Adaptation

white fur and spots

Reason

helps them camoflauge with surroundings so they can hunt prey as a source of food.

ResultsPlus
Examiner Comments

A correct response which gained 1 mark.

8 Snow leopards (*Panthera uncia*) live in mountainous regions in Asia.

The photograph shows a snow leopard on a snow-covered mountain.

(Source: © Natural Visions/Alamy Stock Photo)

(a) Give **one** reason for a named anatomical adaptation of this snow leopard that enables it to occupy its niche.

Use the information in the photograph to support your answer.

(1)

Adaptation

Large and sharp teeth

Reason

To use his teeth to kill its prey easily to eat it easily.

ResultsPlus
Examiner Comments

A correct adaptation and reason.

8 Snow leopards (*Panthera uncia*) live in mountainous regions in Asia.

The photograph shows a snow leopard on a snow-covered mountain.

(Source: © Natural Visions/Alamy Stock Photo)

(a) Give **one** reason for a named anatomical adaptation of this snow leopard that enables it to occupy its niche.

Use the information in the photograph to support your answer.

(1)

Adaptation

Thick fur

~~Snow leopard on a snow-covered mountain~~

Reason

~~[illegible]~~

~~live in mountainous regions in Asia.~~

~~To keep~~ For insulation, and to keep them warm.

ResultsPlus
Examiner Comments

This is an example of the most commonly identified adaptation and reason.

Question 8 (b)

Candidates were provided with a map showing areas in which snow leopards are found.

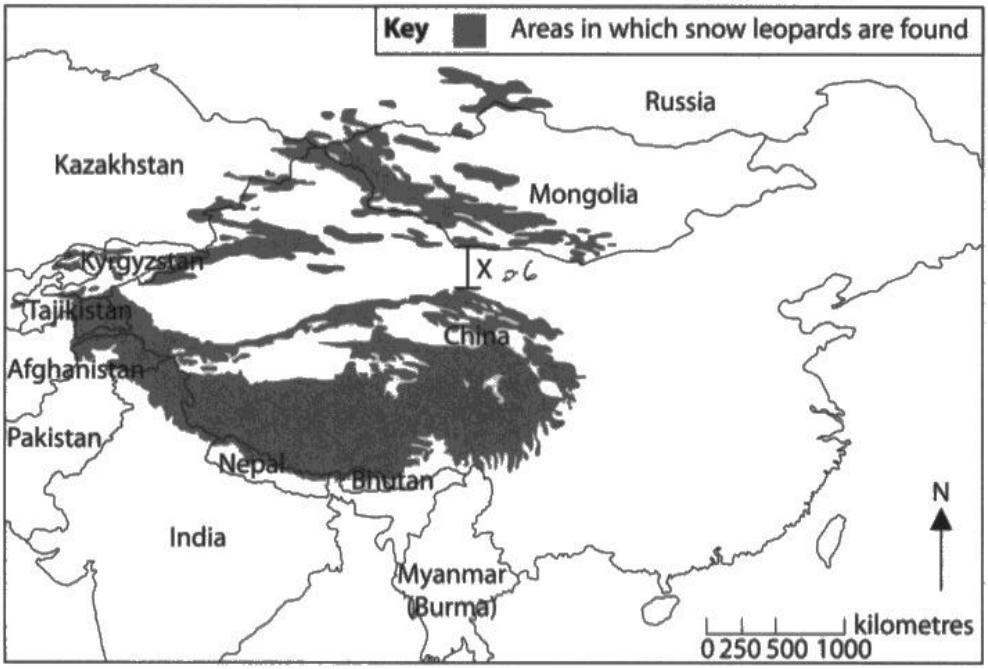
Candidates were asked to describe how biodiversity of habitats in these areas could be compared. As this wording is almost identical to the specification point 4.18, it was anticipated that candidates would focus on the index of diversity equation.

Most candidates gained two or three marks, usually from the first three marking points. The diversity index equation was often given, but there were some errors.

It was disappointing that few candidates recognised that the index of diversity values for the different habitats should be compared.

Some candidates misread the question and described what they thought the biodiversity of the various areas shown on the map would be.

(b) Snow leopards are found in several areas in Asia.



Describe how the biodiversity of habitats in these areas could be compared.

(3)

→ By ~~counting~~ counting the species richness in each area (the number of different species) and

→ By ~~looking~~ analysing ~~comparing~~ the genetic diversity of each species by obtaining their molecular phylogeny by DNA sequencing or proteomics ~~to~~ and compare the sequences to see how genetically different the individuals of a species are.

→ By using the formula: $D = \frac{N(N-1)}{\Sigma n(n-1)}$ to calculate the ~~gene~~ diversity index for each area and compare it.

ResultsPlus
Examiner Comments

This response covered all four marking points and was awarded full marks.

Question 8 (c)(i)

This question gave candidates a graph showing the number of snow leopards in the wild since 2002.

Candidates were asked to calculate the percentage decrease in snow leopards from 2002 to 2022 and give their answer to one decimal place.

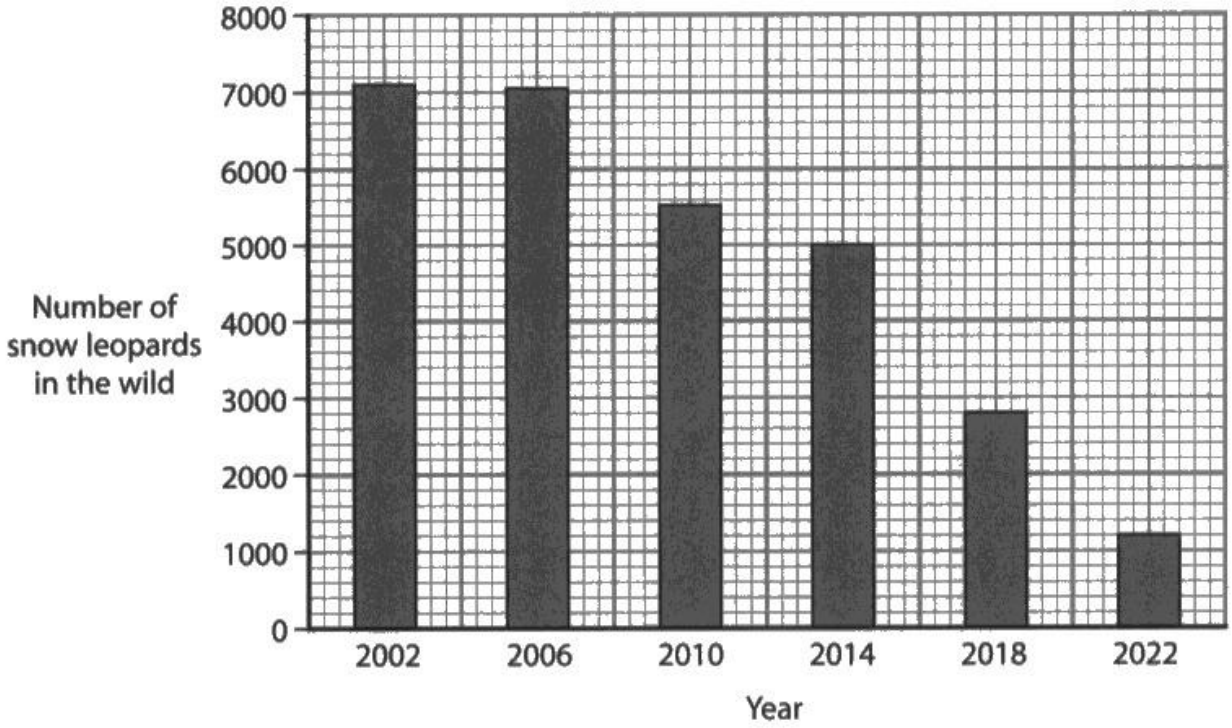
As with other mathematics questions on this paper, candidates did not perform as well as expected.

A significant number of candidates could not read the scale of the graph correctly and therefore used incorrect numbers in their calculations. Some candidates divided by 1200 instead of 7100.

Many candidates did not give their answer to one decimal place.

Centres are reminded of the importance of giving candidates opportunities to practice the required mathematical skills.

(c) The graph shows the numbers of snow leopards in the wild since 2002.



(i) Calculate the percentage decrease in snow leopards from 2002 to 2022.

Give your answer to one decimal place.

(2)

7000 $\frac{7100 - 1200}{7100} \times 100$

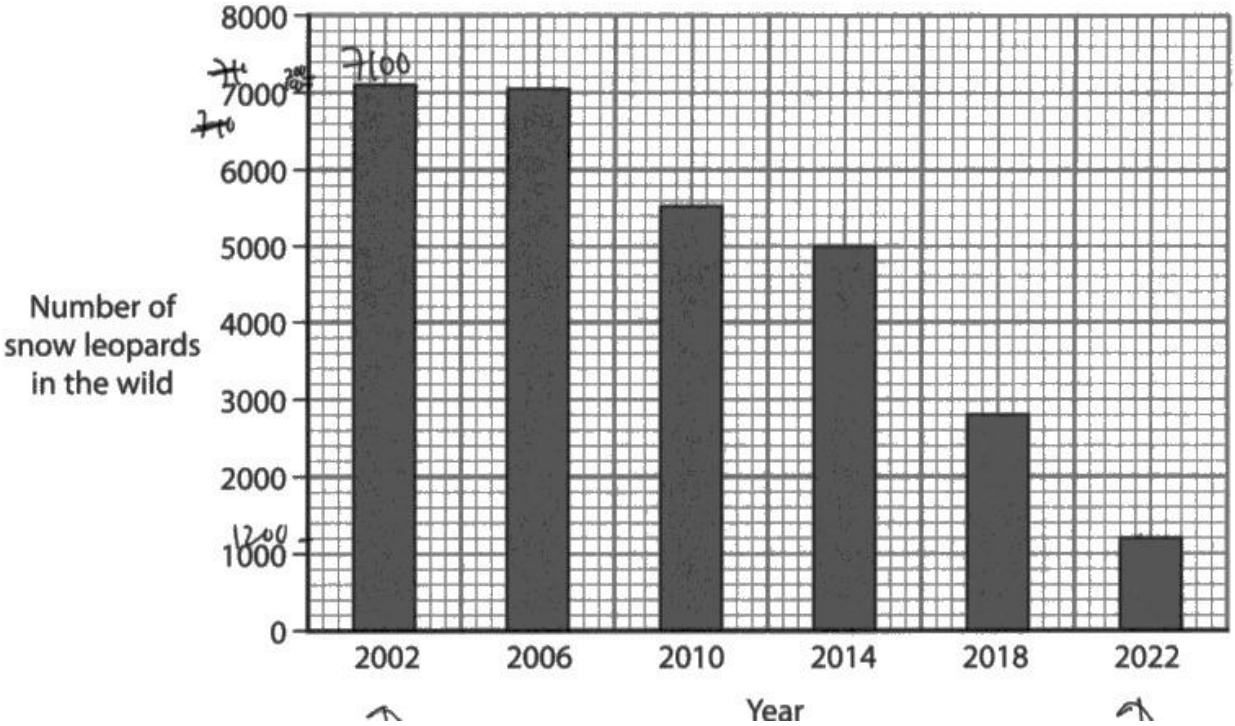
$= 83.098 \simeq 83.1\%$

83.1 %

ResultsPlus
Examiner Comments

This correct answer scored 2 marks.

(c) The graph shows the numbers of snow leopards in the wild since 2002.



(i) Calculate the percentage decrease in snow leopards from 2002 to 2022.

Give your answer to one decimal place.

(2)

$$\frac{7100 - 1200}{1200} \times 100\%$$

$$= 491.6666\ldots\%$$

$$= 491.7\% \ (1\text{dp})$$

~~491.6~~ 491.7 %

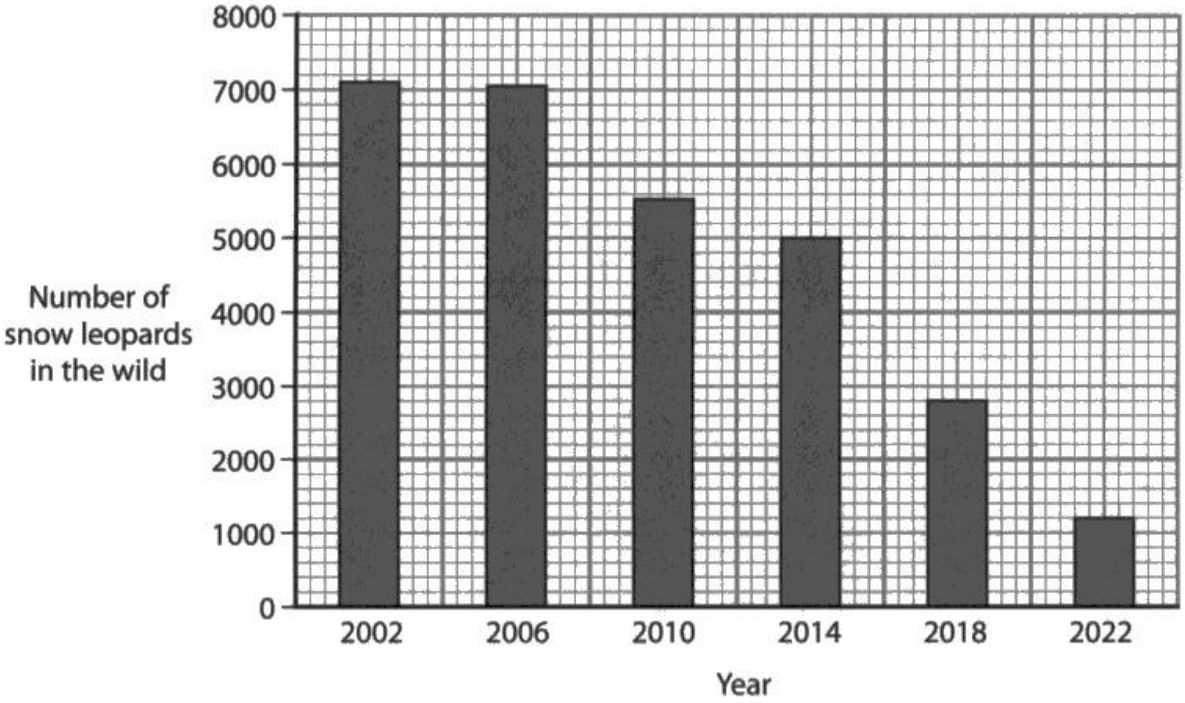
ResultsPlus Examiner Comments

This candidate gained 1 mark for the numerator but they have used an incorrect denominator.

ResultsPlus Examiner Tip

Showing your working is very important.

(c) The graph shows the numbers of snow leopards in the wild since 2002.



(i) Calculate the percentage decrease in snow leopards from 2002 to 2022.

Give your answer to one decimal place.

(2)

$\left[1-\frac{R}{100}\right] \times \text{Ori} = \text{New}$

$\left[1-\frac{R}{100}\right] \times 7100 = 1200$

$-R = -83$

$R = 83\%$

83 %

ResultsPlus
Examiner Comments

Although this candidate has done the correct calculation, they have not given their answer to one decimal place.

ResultsPlus
Examiner Tip

Read the question carefully to make sure you do exactly what you are asked.

Question 8 (c)(ii)

This question asked candidates to suggest one reason for this decrease in the number of snow leopards.

This question was well answered with most responses relating to hunting, disease or habitat destruction.

Some candidates referred to climate change or global warming without any qualification or further expansion which was not creditworthy.

(ii) Suggest **one** reason for this decrease in the number of snow leopards.

(1)

~~the~~ hunting and habitat destruction.

ResultsPlus
Examiner Comments

This response shows two of the most common correct responses, although only the first was marked.

(ii) Suggest **one** reason for this decrease in the number of snow leopards.

(1)

~~There has~~ there has been climate change ~~of~~ over the years

an increase in

ResultsPlus
Examiner Comments

References to climate change unqualified were not creditworthy.

Question 8 (d)(i)

This question asked candidates to calculate the width of the desert region shown on the map and give their answer in standard form.

Most candidates knew how to calculate the width of the desert region using the provided scale, but fewer candidates gave their answer in standard form.

(d) Populations of snow leopards, living in different areas of Asia, sometimes develop different characteristics. These populations are called subspecies.

Individuals from different subspecies are able to produce fertile offspring.

Some scientists have proposed that there are three subspecies of snow leopard.

The table shows the names and locations of the snow leopard range for the three subspecies.

Subspecies	Location of snow leopard range
P. uncia irbis	Northern
P. uncia uncia	Western
P. uncia uncioides	Central

(i) The northern and central locations are separated by a desert region.

The width of the region is shown by the line labelled X on the map.

Calculate the width of this desert region using the scale shown on the map.

Give your answer in standard form.

(2)

6mm

5mm = 250 km

1mm = 50km

300

..... km

This candidate scored 1 mark as they did not give their answer in standard form.

Check to make sure you are giving your answer in the required format.

(d) Populations of snow leopards, living in different areas of Asia, sometimes develop different characteristics. These populations are called subspecies.

Individuals from different subspecies are able to produce fertile offspring.

Some scientists have proposed that there are three subspecies of snow leopard.

The table shows the names and locations of the snow leopard range for the three subspecies.

Subspecies	Location of snow leopard range
P. uncia irbis	Northern
P. uncia uncia	Western
P. uncia uncioides	Central

(i) The northern and central locations are separated by a desert region.

The width of the region is shown by the line labelled X on the map.

Calculate the width of this desert region using the scale shown on the map.

Give your answer in standard form.

(2)

X = 0.65cm

250km = 0.55cm

$X = \frac{250 \times 0.65}{0.55}$

$= 295.5$

3.0×10^2 km

ResultsPlus
Examiner Comments

A correct answer in standard form that was awarded 2 marks.

Question 8 (d)(ii)

Candidates were provided with information about three different subspecies of snow leopard.

This level-based question was a very good differentiator, with the full range of marks seen.

Candidates were expected to analyse the given information on pages 24 to 27 in order to help them answer the question.

Some excellent responses were seen demonstrating that the candidates had analysed how they could use the map, table, graph and written information to support their explanations.

The most common way candidates gained Level 1 was by describing speciation using the theory of natural selection. Some responses included incorrect terminology, for example referring to advantageous genes rather than alleles.

Level 2 responses tended to consider the role of geographical isolation, along with the idea of different selection pressures, the role of mutation and natural selection in the formation of subspecies.

Level 3 responses tended to give greater depth to their explanations and consider the differences that could arise in the different populations and why they were classified as subspecies instead of different species.

Not all candidates were able to recognise how subspecies are not fully different species, and that they still maintain the ability to produce fertile offspring, although it was given in the stem of the question.

*(ii) Explain how these subspecies of snow leopard could form.

Use the information in the question to support your answer.

(6)

By mutations, changes in DNA.

~~By selection~~

the snow leopards adapt to their environment so the ones that survive pass on the advatagas alleles, genes to the next generations so that they will be fit for that specific crea-

ResultsPlus
Examiner Comments

This is an example of a Level 1 response. The candidate has not used any information from the map, table, graph or written information to support their answer.

*(ii) Explain how these subspecies of snow leopard could form.

Use the information in the question to support your answer.

(6)

- The snow leopards separated into groups, one in nothern, western and central. This is because the desert region, which they cannot survive in, served as a geographical isolation.
- These ~~isolation~~ isolated groups are subjected to different selection pressures. So they acquire mutation independently causing change in anatomical, behavioural and physiological changes. Now that they have selective advantage, they are able to survive, reproduce and pass on their advantageous allele to their offsprings.
- This is repeated for a long time generation after generation until the 3 subspecies formed in the three areas.
- They ~~not~~ ~~fo~~ are not fully different species because they are capable of interbreeding to cause fertile offsprings.
- The 2 subspecies formed in central and western due to events such as founder's effect, where small group of snow leopards with unusual alleles leave the main group to start a population, hence amplifying that new allele.

ResultsPlus
Examiner Comments

This is an example of a Level 3 response, where the candidate has analysed all of the given information and used it to support their answer.

*(ii) Explain how these subspecies of snow leopard could form.

Use the information in the question to support your answer.

(6)

the snow leopard are geographically isolated, to northern or central or western regions.
and ~~OFF~~ mutation occurs leading to ~~the~~ various alleles arising some of which are advantageous for example thick fur. ~~and the~~ there are different selection pressure in each area (such as colder temp or prey) the organism with advantageous alleles survive and reproduce passing on the allele to next generations over many generations the allele frequency changes and this leads to different subspecies forming (natural selection).
So for example in one area where the colder temp is a selection pressure the organisms which contain advantageous alleles (very thick fur) survive and reproduce and over time the snow leopard change into different subspecies but not different species as they can reproduce fertile offspring so not reproductively isolated.

ResultsPlus
Examiner Comments

This is an example of a Level 3 response where the candidate has supported their own knowledge and understanding with relevant information from the question.

Question 8 (d)(iii)

This question asked candidates to give a reason as to why these different populations of snow leopard are described as subspecies and not different species.

Candidates who read the given information carefully in Q08 tended to gain the mark. There was a lack of precision in some answers, for example not including the idea of individuals from different subspecies breeding together.

Non-creditworthy responses tended to centre around molecular phylogeny, which was not relevant for this particular context.

(iii) Give a reason as to why these different populations are described as subspecies and not different species of snow leopard.

(1)

They are still able to produce fertile offspring when they mate with the other subspecies of snow leopard.

ResultsPlus
Examiner Comments

This is an example of a correct answer which scored 1 mark.

Paper Summary

Based on their performance on this paper, candidates should:

- Read the whole question carefully, including the introduction, to help relate your answer to the context asked. Answers which do not match the command words or do not relate to the given context will not gain high marks.
- Remember that the information provided is there specifically to help you. Read it carefully and analyse what information you will need to use to provide a high-level response to the question being asked.
- Not try and make a mark scheme you have learnt from a different paper fit a different question with a different context and command word.
- Study all of the mathematical skills in the specification which could be tested at this level, as a minimum of 8 marks are included on each AS paper that target mathematics at Level 2 or above.
- Make sure you include all of your working and give units where applicable. Take careful note of the additional requirements for your answer eg decimal places, significant figures or standard form.
- Make a rough plan to help structure your answers to level-based questions.