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IAL Biology WBI12 01

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Introduction

This paper tests 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 provides ample opportunity for candidates to demonstrate their grasp of these topics.

The paper appears to have worked well, with nearly all questions achieving the full spread of marks. It was evident that some areas of the specification are better understood than others. The application of knowledge regarding post-transcriptional changes to mRNA and phenotypes being affected by multiple alleles for the same gene proved more challenging.

A significant issue for some candidates on the paper was not reading the question carefully and, in particular, not taking careful note of the command words in the questions. For example, an 'explain' question often had answers which just described and a 'give a reason' question often had answers which did not give a reason.

It was pleasing to see such large numbers of excellent responses which were clear and comprehensive, answered the question asked and showed good use of technical terms and application of relevant biological knowledge.

Question 1 (a)

This question asks candidates to state what is meant by the term organ.

Many excellent definitions were seen which gained the mark, showing good understanding of this biological terminology.

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

(1)

A group of different cells working together to carry out a function.

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Examiner Comments

This is the definition for a tissue, not an organ.

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

(1)

A group of tissue connected together.

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Examiner Comments

This is not a sufficient enough response to score.

Question 1 (b)(ii)

This question asks candidates to give the name and function of the organelle that contains the nucleolus.

It is important that candidates read the question carefully. A number of responses referred to aspects of the cell that were not an organelle. A small number of candidates gave the answer 'nucleolus' which was also not creditworthy. Most candidates could recognise that the nucleus contained the nucleolus and could give a correct function.

(ii) The organelle surrounded by the membrane labelled Y contains the nucleolus.

Give the name and function of the organelle that contains the nucleolus.

(1)

Name nuclear envelope

Function protects the nucleus and has pores for material ~~exchange~~ (substances) exchange

ResultsPlus
Examiner Comments

An example of a common incorrect response.

(ii) The organelle surrounded by the membrane labelled Y contains the nucleolus.

Give the name and function of the organelle that contains the nucleolus.

(1)

Name Nucleus

Function Contains the genetic material / DNA that are loosely packed / uncondensed known as chromatids, these genes control / code for processes such as protein synthesis. RNA is formed

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Examiner Comments

An example of a correct response.

Question 1 (b)(iv)

This question asks candidates which domain would contain an organism with endoplasmic reticulum and a nucleus.

Most candidates recognised that it would be the domain Eukarya. There were a small number of responses which did not give the name of a domain.

Question 1 (c)(ii)

This question asks candidates to explain how the structure of starch enables the potato tubers to have a high energy content.

It is important that candidates read the question carefully; answers relating to properties such as being insoluble were not creditworthy. Nearly all candidates understood that starch is made from the monomer glucose, with many answers correctly linking the compact structure to the context of the question.

(ii) Explain how the **structure** of starch enables the potato tubers to have a high energy content.

(2)

, Starch is large so release alot of ~~glucose~~ glucose. gener. For respiration

, Compact so Store alot of glucose in small space.

, Branched so ~~when~~ release alot of ~~Energy~~ glucose For respiration and energy ~~for~~ when hydrolysis.

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Examiner Comments

This response scores full marks.

Question 2 (a)(iii)

This question requires candidates to measure the length of the scale bar in order to help them to calculate the magnification of photograph W.

The easiest way for candidates to do this is to measure the width of the scale bar and convert it into micrometres. Then they need to divide this by 24 to gain the correct magnification. It is very important that candidates are taught how to convert units correctly, as this was the main reason that candidates failed to give a correct answer.

(iii) Calculate the magnification of photograph **W**.

Use the scale bar to help you.

$\frac{1.8 \times 10 \times 1000}{24} = \frac{18000}{24} = 750$ (1)

Answer ..... X 750 .....

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Examiner Comments

An example of a correct answer, showing how to correctly convert cm into micrometers.

(iii) Calculate the magnification of photograph **W**.

Use the scale bar to help you.

magnification = $\frac{\text{Image size}}{\text{actual size}}$

$= \frac{0.024}{18} = 1.3 \times 10^{-3}$

I

A M

$\frac{24}{1000} = 0.024$ (x10)

km m cm mm

(1)

Answer ..... 1.3×10^{-3} .....

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Examiner Comments

An example of a response which did not convert units correctly and divided by the wrong denominator.

Question 2 (b)

This question requires candidates to calculate the number of cells in the tissue that were interphase.

This is a novel way of testing the specification point and it proved to be challenging for many candidates. The most common answer was 1200, with most candidates not realising that they needed to subtract the number of cells in mitosis from this.

(b) The mitotic index of a tissue was calculated.

The tissue had 450 cells in mitosis and the mitotic index was 37.5%.

Calculate the number of cells in this tissue that were in **interphase**.

(2)

$\frac{\text{mitosis}}{\text{total}} \times 100 = 37.5$

$\frac{450}{x} \times 100 = 37.5$

$\frac{450}{x} \times \frac{37.5}{100}$

$x = 1200$ total

$1200 - 450 = 750$

Answer 750

ResultsPlus
Examiner Comments

An example of an answer scoring full marks.

(b) The mitotic index of a tissue was calculated.

The tissue had 450 cells in mitosis and the mitotic index was 37.5%.

Calculate the number of cells in this tissue that were in **interphase**.

(2)

$\frac{450}{x} \times 100 = 37.5\%$

cells : %

450 : 37.5

x : 100

$\frac{100 \times 450}{37.5} = 1200$ cells

Answer 1200 cells

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Examiner Comments

An example of the most common 1 mark response.

Question 2 (c)

This question asks candidates to describe the events that occur during prophase of mitosis.

Many excellent descriptions were seen, which covered all three marking points.

(c) Describe the events that occur during prophase of mitosis.

(2)

In prophase of mitosis, nucleolus disappears and cell surface membrane also disappears.

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Examiner Comments

This response is awarded mark point 2 only.

(c) Describe the events that occur during prophase of mitosis.

(2)

Nuclear envelope and nucleolus dissappears
DNA condenses, Chromosomes start to be visible
Centrioles start moving to opposite poles of the cell.

ResultsPlus
Examiner Comments

This response covers all of the available marking points needed to score full marks.

Question 2 (d)(i)

This question asks candidates to give an example of a tissue that could be produced in a plant.

It was disappointing that candidates could not link the understanding of what a tissue is from topic three to their plant knowledge from topic four. Numerous incorrect answers were given that were molecules, cells or organs.

(d) Some new cells produced by mitosis are used for repairing damaged tissues.

Some new cells produced by mitosis are used for growth of tissues.

(i) Give an example of a tissue that could be produced in a plant.

(1)

cellulose

ResultsPlus
Examiner Comments

A common incorrect response.

(d) Some new cells produced by mitosis are used for repairing damaged tissues.

Some new cells produced by mitosis are used for growth of tissues.

(i) Give an example of a tissue that could be produced in a plant.

(1)

The root hair cell.

ResultsPlus
Examiner Comments

This is not an example of a tissue.

Question 2 (d)(ii)

This question tests specification point 3.14.

Numerous correct responses were seen referring to asexual reproduction. Candidates are encouraged to read the question carefully, as the most common incorrect response centred around roles given in the question, with a significant number of candidates giving more than one answer.

(ii) Give **one role**, other than for growth or repair, for new cells produced by mitosis.

(1)

Asexual reproduction

ResultsPlus
Examiner Comments

An example of a correct answer.

(ii) Give **one role**, other than for growth or repair, for new cells produced by mitosis.

(1)

cell division

ResultsPlus
Examiner Comments

This is not creditworthy.

Question 3 (a)

This question requires candidates to analyse the given image and accompanying information.

Most candidates were able to recognise the anatomical adaptations that enabled the penguin to swim and catch prey. Some candidates considered the benefits of the different coloured feathers. Higher level responses explained how a stated adaptation would provide insulation or decrease heat energy loss, whereas weaker answers referred to keeping the penguin warm.

(a) Explain **two** anatomical adaptations of these penguins that enable them to survive in this environment.

Use the information in the question to support your answer.

(2)

Adaptation 1 Warm ~~fea~~ body temperature

Reason to ~~help~~ help them adapt to the cold weather of Antarctica

Adaptation 2 Ability to swim

Reason to be able to obtain its nutrients from the sea (Fish).

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Examiner Comments

These are not anatomical adaptations.

(a) Explain **two** anatomical adaptations of these penguins that enable them to survive in this environment.

Use the information in the question to support your answer.

(2)

Adaptation 1 dark coloured / black coloured skin swimming in very cold waters.

Reason helps them to hide from predators, and helps them to catch their prey when it's dark as the prey can't see them.

Adaptation 2 their black, dark skin coloured

Reason helps them to absorb heat- form warming as black absorbs heat.

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Examiner Comments

This response scores mark point 5.

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Examiner Tip

Ask yourself if you have made sufficient different points in your answer.

(a) Explain **two** anatomical adaptations of these penguins that enable them to survive in this environment.

Use the information in the question to support your answer.

(2)

Adaptation 1 Long beaks

Reason so they can be able to catch fish, squid or shrip in waters.

Adaptation 2 streamline body

Reason to reduce water resistance to be able to swim faster.

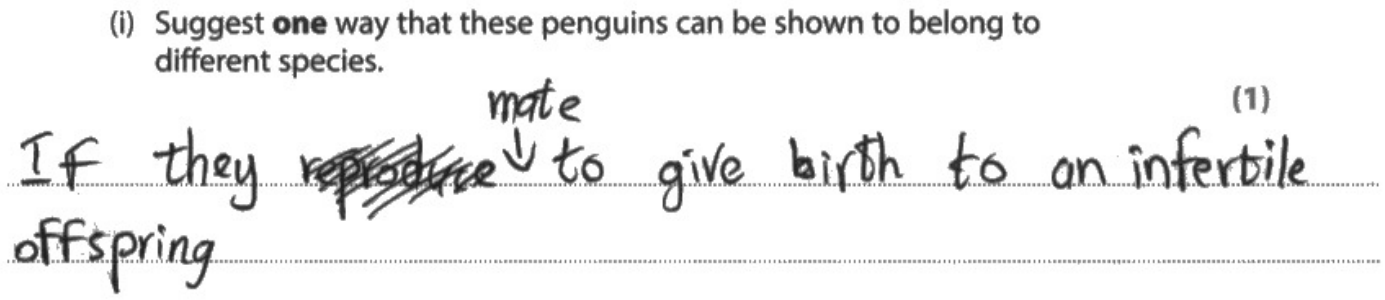
ResultsPlus
Examiner Comments

This response scores full marks.

Question 3 (b)(i)

This question requires candidates to suggest one way that the gentoo penguin populations can be shown to belong to different species.

Most responses centred around infertile offspring or molecular phylogeny, demonstrating candidates understanding of this aspect of the specification.


(i) Suggest **one** way that these penguins can be shown to belong to different species.

(1)

If they ~~reproduce~~ mate to give birth to an infertile offspring

ResultsPlus
Examiner Comments

This response achieves the 1 mark.

Question 3 (b)(ii)

This question asks candidates to explain how different species of gentoo penguin could have formed.

This question proved to be a vey good differentiator and the full range of marks were awarded. Most candidates could use the provided map to explain that the penguins would not meet to breed due to being located a long distance away from each other. Although many candidates could explain that an advantageous allele would increase the survival and reproduction chances of a penguin, they did not always link this to different selection pressures on the different island groups. Candidates need to be careful that they use appropriate terminology in their answers; frequent mentions of advantageous genes were seen.

(ii) Explain how different species of gentoo penguin could have formed.

Use the map to support your answer.

(5)

• penguin ~~pe~~ live in different island, like SouthGeorgia Falkland islands and south Shetland Island.

• They have geogarphical isolation, therefore genes can not exchage or no gene flow between different popdstion of penguin living in different island.

• different mutation occur, therefore change in gene poors.

• because of different mutation their behaviour may chage may cause behavioural isolation of them.

• different environment cause different selection pressure of alleles, some ~~allele~~ individual has selection advantage alleles ~~therefore~~ higher chance to survive and ~~re~~reproduce, pass on it alleles.

• after many generation, allele frequency increase, and different gentoo penguin ~~in~~ in different island can no longer interbreed to have fertile offspring.

• therefore reproduction isolation of gentoo penguin living in different ~~is~~ island.

: different species of gentoo penguin formed.

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Examiner Comments

This response scores full marks for a detailed explanation.

Question 4 (a)

This question requires candidates to draw a mammalian sperm cell and label the acrosome, nucleus and a mitochondrion.

Many excellent drawings were seen, showing candidates knowledge of the structure of a mammalian sperm cell. The most common mistakes were the omission of the mid-piece or thinking that the nuclear membrane was the same as the cell membrane. Candidates are reminded that it is important that label lines touch the structure that they are labelling.

4 All living organisms are made of cells.

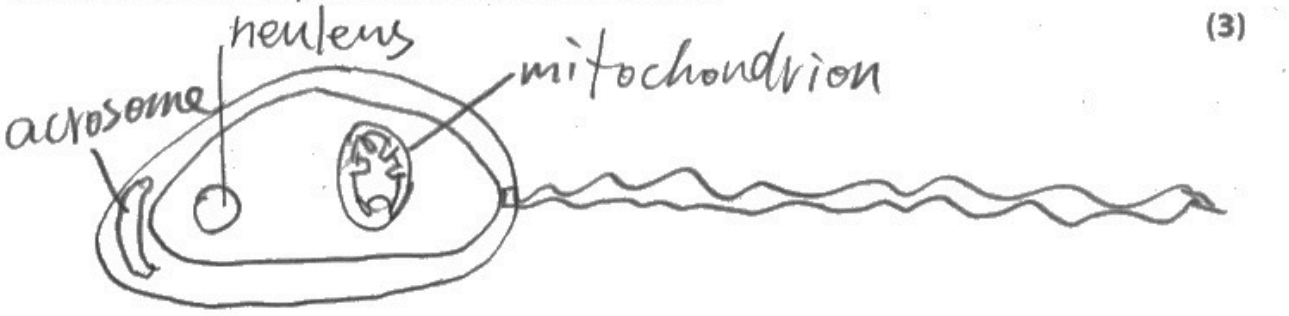
Some cells are specialised for their function.

(a) One specialised cell is the sperm cell.

Draw a mammalian sperm cell showing the acrosome, the nucleus and a mitochondrion.

Label the acrosome, nucleus and mitochondrion.

(3)



ResultsPlus
Examiner Comments

This candidate fails to achieve full marks due to omitting the mid-piece of the sperm cell.

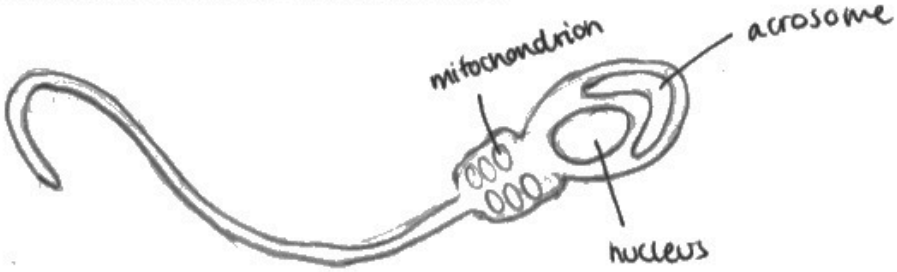
4 All living organisms are made of cells.

Some cells are specialised for their function.

(a) One specialised cell is the sperm cell.

Draw a mammalian sperm cell showing the acrosome, the nucleus and a mitochondrion.

Label the acrosome, nucleus and mitochondrion. **(3)**



ResultsPlus
Examiner Comments

This drawing is sufficient to gain all 3 marks.

Question 4 (b)(iii)

This question asks candidates to explain three ways in which a mammalian egg cell is specialised for its functions.

It is important that candidates take careful note of the command word. Descriptions are not sufficient. Most creditworthy responses correctly explained why the egg cell contained cortical granules or why the egg cell contained a haploid nucleus. More detailed responses explained why the egg cell contained lipid droplets. A small number of responses gave explanations as to how the mammalian sperm cell was specialised for its functions.

(iii) Explain **three** ways in which a mammalian egg cell is specialised for its functions.

(3)

- Has acrosome which contain hydrolytic enzyme to digest zona pellucida of secondary oocyte so sperm nucleas can enter cytoplasm and fuse with egg cell nucleus forming a diploid zygote.
- Has haploid nucleus which contain half number of chromosomes, so when it fuse with egg cell nucleas the diploid number of chromosomes is restored giving a diploid zygote
- Has many mitochondria for aerobic respiration and production of energy (ATP) needed for swimming to reach egg cell and fertilize it (flagellum enables

ResultsPlus
Examiner Comments

This response scores 1 mark.

ResultsPlus
Examiner Tip

Make sure you are answering the question that is being asked.

(iii) Explain **three** ways in which a mammalian egg cell is specialised for its functions.

(3)

Mammalian egg cells contains happid female nucleus so that when fertilisation takes place, it becomes diploid.

Mammalian egg cells have lipid droplets which act as a source of energy for zygote after fertilisation. It also has cortical granules which fuse with zona pellucida and harden it to prevent polyspermy.

It also has a large cytoplasm to store energy resource and organelles required for the zygote.

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Examiner Comments

This answer covers all of the available marking points to achieve full marks.

Question 4 (b)(i)-(ii)

This question requires candidates to calculate the volume of the human egg cell which has a radius of 50μm and then use their answer to calculate the surface area to volume ratio.

Most candidates could use the given formula to correctly calculate the volume of the egg cell. However, a significant number of candidates ignored the provided :1 on the ratio answer line or gave the volume to surface area ratio.

(b) A human egg cell is another example of a specialised cell.

(i) A human egg cell has a radius of 50 μm.

Calculate the **volume** of this human egg cell.

Use the formula:

$V = \frac{4}{3}\pi r^3$ $= \frac{4}{3} \pi \times 50^3 = 523598.8$

(1)

Answer 523598.8 μm^3

(ii) The surface area of this egg cell is 31 416 μm^2.

Give the surface area to volume ratio of this egg cell.

(1)

$\frac{31416}{523598.8} = 0.06 : 1$

Answer 0.06 : 1

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Examiner Comments

Two correct calculations to achieve the marks.

(b) A human egg cell is another example of a specialised cell.

(i) A human egg cell has a radius of 50 µm.

Calculate the **volume** of this human egg cell.

Use the formula:

$$V = \frac{4}{3}\pi r^3$$

$V = \frac{4}{3}\pi(50)^3 = 523598.7756$ (1)

Answer 523598.8 µm³

(ii) The surface area of this egg cell is 31 416 µm².

Give the surface area to volume ratio of this egg cell.

(1)

$\frac{523598.8}{31416} = 16.66662847$

≈ 16.7

Answer 16.7 : 1

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Examiner Comments

This candidate calculates the correct volume, but gives the volume to surface area ratio.

Question 5 (a)(i)

This question asks candidates to state what is meant by the term locus.

Although this has been asked in previous series, a wide variation of answers were seen.

(i) These alleles are found at the same locus.

State what is meant by the term **locus**.

(1)

It is the location of a gene on a chromosome

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Example of a correct definition.

(i) These alleles are found at the same locus.

State what is meant by the term **locus**.

(1)

Location of the allele/ gene.

ResultsPlus Examiner Comments

This is an incomplete definition so does not score.

Question 5 (a)(ii)

This question requires candidates to apply their knowledge of how phenotypes are affected by multiple alleles for the same gene.

Although the question clearly states that these multiples alleles were from the same gene, frequent references to polygenic inheritance were seen. Higher level answers correctly explained that different alleles would code for different mRNA and result in a different protein being formed. However many responses referred to crossing over, differential gene expression, linkage or epigenetic modification which were not creditworthy.

(ii) Explain how these alleles can produce fruit flies with different coloured eyes.

(2)

alleles have different combination due to crossing over and independent assortment. so different proteins that determine the colour of eyes are produced.

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Examiner Comments

This response correctly explains that different alleles would result in different proteins being formed and is awarded marking point 2.

(ii) Explain how these alleles can produce fruit flies with different coloured eyes.

(2)

Different alleles have different base sequences, transcripted into different mRNA, mRNA translated into different ~~pro~~ primary structure of different protein determine ~~the pigment~~ different colours in eye.
leads to different secondary / tertiary structure produce different enzyme / protein / pigment,

ResultsPlus
Examiner Comments

This response gains full marks.

Question 5 (b)

This question tells candidates that one gene gave rise to more than one protein. Candidates are then expected to recognise that they needed to apply their knowledge of post-transcriptional changes to mRNA.

It was disappointing that a significant number of candidates did not read the question correctly and instead gave answers relating to differential gene expression and epigenetic modification. Many excellent explanations were given by those candidates who did read the question carefully, with marking points 1 to 4 frequently being awarded. Fewer candidates gave the additional detail about how a different exon sequence could result in the different given proteins or how the proteins could result in the development of either male or female fruit flies.

(b) The development of an embryo into either a female or a male fruit fly is determined by two different proteins.

The female specific Dsx-F protein leads to the development of a female fly and the male specific Dsx-M protein results in a male fly.

Both proteins are the product of the same gene.

Explain how this gene can give rise to either a female or a male fly.

(4)

differential gene expression, ~~genes~~ for females genes coding for Dsx-F protein are switched on and genes coding for Dsx-M are switched off, while for males genes coding for Dsx-M are switched on and genes coding for Dsx-F are switched off, transcription occurs on switched on genes making active mRNA, translation of active mRNA produces protein, the protein determines it's shape and function, either Dsx-F protein for females or Dsx-M protein for males.

due to epigenetic modification

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Examiner Comments

This was a common response by candidates who did not realise that the question was about post-transcriptional changes to mRNA. Only marking point 4 can be awarded here.

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Examiner Tip

Read the question carefully to ensure you understand what you are being asked to explain.

(b) The development of an embryo into either a female or a male fruit fly is determined by two different proteins.

The female specific Dsx-F protein leads to the development of a female fly and the male specific Dsx-M protein results in a male fly.

Both proteins are the product of the same gene.

Explain how this gene can give rise to either a female or a male fly.

(4)

The gene is transcribed into pre-mRNA. A spliceosome will remove introns and sometimes exons. Also there can be a rearrangement of exons in the mRNA. This gives a different active-mRNA ~~so~~ base sequences. Translation occurs and two different proteins are made as primary sequence is different for both. The protein if Dsx-F causes a female and if Dsx-M causes a male. This is a protein called RNA-splicing

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Examiner Comments

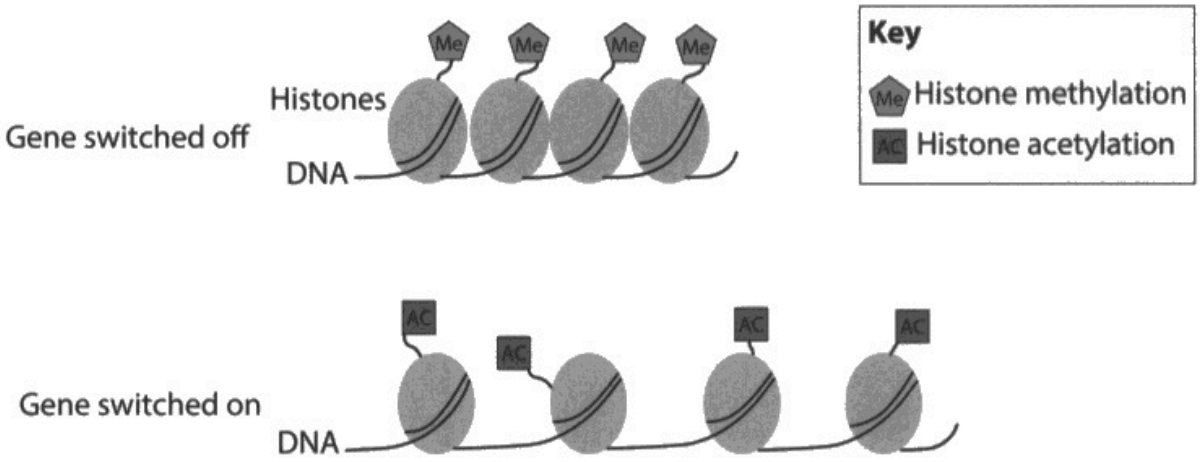
This response gains full marks for including marking points 1, 2, 3, 4 and 5.

Question 5 (c)

This question requires candidates to analyse the given diagram carefully. They need to use this information to help them explain how histone modification can affect gene expression.

A large number of excellent explanations were seen, demonstrating good understanding of this part of the specification. A common error was to refer to the methylation or acetylation of DNA instead of the histones which negated marking point 1. Although the diagram clearly showed the difference in the spacing of the histones, few candidates referred to this in their explanations. However, frequent correct uses of relevant terminology such as heterochromatin or euchromatin were seen. Higher level answers also included marking point 5.

✳ (c) Histone modification can affect gene expression, as shown in the diagram.



Explain how histone modification can affect gene expression.
Use the diagram to support your answer.

(5)

Histone methylation ~~can~~ switches off the gene by adding ~~meth~~ methyl group to lysine which makes the DNA more ~~tight~~ coiled preventing transcription of the gene by preventing transcriptional factors from binding. Histone acetylation turns ~~it~~ on the gene by adding ~~acet~~ acetyl to lysine so it uncoils the gene forming euchromatin, so transcriptional factors can bind so transcription can take place.

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Examiner Comments

This is a concise answer which gains full marks.

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Examiner Tip

Ensure you use the given information to support your answer.

Question 6 (a)(i)

This question requires naming the structure labelled X on the diagram.

Most candidates could name the vacuole, although many variations in spelling were seen. Common incorrect responses included guard cell or stomata. Candidates are reminded that giving multiple answers will not gain marks.

Question 6 (a)(ii)

This question asks candidates to suggest why the closing of the pores reduces water stress in the plant.

Many excellent answers were seen related to reducing transpiration.

(ii) Suggest why the closing of the pores reduces water stress in the plant.

(1)

Because ~~these~~ this will reduce the rate of transpiration in plants, less water loss from plants by transpiration.

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Examiner Comments

An example of a correct answer.

Question 6 (c)

This is the only level-based question on this paper. Candidates are given information regarding the effect of water stress on three aspects to do with wheat plants.

Many candidates also included aspects relating to the graph in Q05(b). Candidates usually achieved level 1 by giving correct conclusion(s) from the four graphs. To move into levels 2 and 3, candidates need to use their biological knowledge and understanding. The most common way that candidates accessed level 2 was by linking the reduction in chlorophyll or water to a reduction in photosynthesis. Other candidates accessed level 2 by considering why the chlorophyll content had reduced. The more detailed responses accessed level 3 by also considering how smaller roots would affect the absorption of water/ mineral ions and the effect of reduced cellulose content on cell wall tensile strength.

Deduce how water stress could affect the growth of wheat plants.

Use information from the whole of Question 6 and your own knowledge to support your answer.

(6)

Water stress swells cells

no stress causes much greater loves of cellulose content, (by 5.2%), larger root length (by 2.5cm) chlorophyll by 47%, which are all needed for growth of wheat and to obtain nutrients from soil (roots) and convert sunlight to energy (chlorophyll), and cellulose for strength

water stress reduces these factors, thus reduces growth as wheat will be deprived of nutrients from soil (short roots), energy (chlorophyll) and be more likely to break in wind (cellulose)

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This is an example of a level 1 response, where the candidate hasn't used their own knowledge to support their answer.

Deduce how water stress could affect the growth of wheat plants.

Use information from the whole of Question 6 and your own knowledge to support your answer.

(6)

Wheat plants have less chlorophyll content when there is water stress. This causes less trapping of sunlight, so less photosynthesis so less energy produced for growth and mitotic divisions, so less chances of survival over long term as wheat plants with water stress had 2a % chances of survival while plants without had 100%. Root length decreases as there is no need for deep roots as even water at surface is absent, so conserve a little energy for root growth. Cellulose content is less as there is less growth, so shorter leaves, and stem, so less number of cells having cellulose cell walls, so less overall cellulose. In graphs B and C, there is a significant difference as SDs don't overlap, so high confidence in results due to high validity and reliability in results. In graph A, range bars need to be drawn to increase validity and reliability

(Total for Question 6 = 9 marks)

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Examiner Comments

This shows a common way that candidates accessed level 2; building on their graph conclusions to link the reduction in chlorophyll to the reduction in photosynthesis.

Deduce how water stress could affect the growth of wheat plants.

Use information from the whole of Question 6 and your own knowledge to support your answer.

(6)

chloropyll content of the wheat plant was higher when there was no water stress ~~(3.7 to 1.~~ (3.2 : 1.7) this is due to more magnesium ions absorbed when there is no water stress. No chlorophyll means no glocuse productions (so no ATP) Mean cellulose content is more in no water stress with no overlapping between the error bars (There is a significant diffrence). cellulose is used in the cell wall of the plant. A weak cell wall well cause the plant to wilt and easily ~~bre~~ be broken.

Mean root length in no water stress is more with no overlapping between error bars (~~Are~~ significant diffrence). The longer the root length the more water and minerals it can absorb.

Mean percentage of survival in no water stress is much higher than no water stress due to availability of water and minerals for growth and photothynsis. As well as stronger cell wall to ~~t~~ support the plant.

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Examiner Comments

This is an example of a level 3 response, achieving full marks.

Question 7 (a)

This question asks candidates to explain why the body cells of the mother and baby have genetic similarities and differences.

Candidates are told that each gamete of a Malayan tapir contains 26 chromosomes, but few used this information in their answer. Most candidates could explain why there was a genetic difference, with the most commonly awarded marking point relating to crossing over in meiosis resulting in genetic variation. It was surprising that many candidates did not consider that half of the chromosomes in the baby's cells would have come from the father. Many candidates recognised why there would be genetic similarities between the mother and baby body cells, but lack of precision in terminology sometimes prevented the awarding of marking point 1.

(a) The body cells of the mother Malayan tapir have some genetic similarities to and differences from the cells of her baby.

Explain why the body cells of the mother and baby have genetic similarities **and** differences.

(3)

The Malayan tapir mother has similarities with her baby because the 26 chromosomes that are found in the Malayan tapir baby half of them are from the mother, chromosomes contains the genes that are passed down from parent to child.

For the difference it's because the other half of the 26 chromosomes are passed down from the father so any genetic difference is the cause of the baby inheriting that gene from his father.

ResultsPlus
Examiner Comments

This response uses the given information and, own knowledge regarding fertilisation, to give an answer which gains marking points 1 and 2.

Question 7 (b)(ii)

This question asks candidates to explain how scientists could determine if a change in the frequency of the recessive allele was occurring over time.

Most candidates knew that the Hardy-Weinberg equation would be used, but some candidates did not explain how this could be used to determine a change over time. Few candidates explained what information would be needed in order to calculate the recessive allelle frequency. A significant minority of candidates described the use of the heterozygosity index.

(ii) Explain how scientists could determine if a **change** in the frequency of the recessive allele was occurring over time.

(2)

Count the number of melanistic tapirs – this is the number of tapirs which have 2 recessive alleles. Use the Hardy-Weinberg equation. q^2 = number of melanistic tapirs / total number of tapirs. Square root this value to find q, the frequency of the recessive allele. Repeat this every year to see ~~if there~~ any changes in allele frequency over time.

ResultsPlus
Examiner Comments

This response gains full marks, including the infrequently awarded marking point 1.

Question 7 (c)(i)

This question asks candidates to analyse the map to give one similarity between the current and earlier distribution of the Malayan tapir.

Despite the word similarity being emboldened, a significant minority of candidates did not give a similarity. Most of the creditworthy responses centred around which countries the tapirs were, or were not, found in at both time points.

(i) Give **one similarity** between the current and earlier distribution of the Malayan tapir.

(1)

At both times the Malayan Tapir was found ~~in the same region~~ Somatra.

ResultsPlus
Examiner Comments

An example of a correct similarity.

(i) Give **one similarity** between the current and earlier distribution of the Malayan tapir.

(1)

~~It~~ has The Malayan tapirs ~~population~~ has distribution has decreased over time.

ResultsPlus
Examiner Comments

This is not a similarity so no mark can be awarded.

Question 7 (c)(ii)

This question asks candidates to suggest one reason why human activity caused this change in tapir distribution.

Most candidates recognised they were being asked for a reason but a significant minority just stated a human activity without giving any reason.

(ii) One difference is that the distribution has reduced due to human activity.

Suggest **one** reason why human activity has caused this change in distribution.

(1)

Some Malayan tapir are killed by people so ~~their~~ number of Malayan tapir decreases and cover less area.

ResultsPlus
Examiner Comments

This response links the human activity to a reason as to why it caused a change in distribution.

Question 7 (c)(iii)

This question asks candidates to explain how a captive breeding programme could maintain the genetic diversity of Malayan tapir populations.

It is important that candidates read the question carefully and do not just give a stock answer from a previous exam series which does not answer the question being asked. A significant number of candidates explained how a captive breeding programme could ensure the increase in population, which was on a previous exam paper. This does not answer the question asked so no marks can be awarded. Where candidates did answer the question being asked, they usually gained marking points 2 and 3.

(iii) A study suggested that the genetic diversity of the Malayan tapirs has decreased due to populations being separated from each other.

Explain how a captive breeding programme could maintain the genetic diversity of Malayan tapir populations.

(3)

(Collect malayan tapir individuals from different separated areas in Thailand & Sumatra) keep malayan tapirs in zoos, to control some of abiotic factors (ex-situ), encourage breeding of malayan tapir individuals from separated areas to increase population size, while breeding, keep records of mated malayan tapirs individuals in studbooks to prevent inbreeding, and carry genetic DNA analysis, to see variety of alleles, and maintain presence of rare allele, and ensure number of different alleles is/A reduced (keep them safe from predation)

ResultsPlus
Examiner Comments

This response gains all of the available marking points.

Question 8 (a)

This question asks candidates to describe the role of the rough endoplasmic reticulum in the formation of extracellular enzymes.

It was disappointing that many candidates could not separate the role of the rough endoplasmic reticulum from the role of the Golgi apparatus. A significant number of responses referred to the role of the wrong organelle. Where candidates did refer to the role of the RER they frequently lost marks due to incorrect terminology or carelessness, for example referring to transcription instead of translation or the synthesis of lipids instead of proteins. Higher level answers referred to the formation of secondary or tertiary structures, with the more detailed responses describing the bonds that would be formed.

(a) Describe the role of the rough endoplasmic reticulum in the formation of extracellular enzymes.

(3)

Rough endoplamic reticulum contains ribosomes which are site of mRNA translation, ribosomes ~~assemble~~ translate mRNA sequence into a required to make extracellular enzyme specific sequence of amino acids by assembling amino acids together in a specific order, the amino acids chain then enters cisternal space, the amino acids coding for extracellular enzymes are modified in cisternal space by being folded into a secondary structure (for example) and are then packed into transport vesicles to reach golgi apparatus to be further modified, the extracellular enzyme is then packed into secretory vesicle. The ~~protein~~ extracellular enzyme ~~has~~ a

ResultsPlus
Examiner Comments

This response is awarded mark points 1, 2 and 4.

Question 8 (b)(i)

This question provides candidates with information regarding an investigation into the digestion of molecules in wood blocks by two different species of fungus. Candidates are asked to comment on the results of the investigation, which involved the synthesis of a number of factors from the provided information in order to provide a judgement. The command word definition states that more than two factors need to be synthesised.

Nearly all candidates could correctly interpret the given data to make the judgement that there was a higher mass loss in the blocks with species A. Most candidates also stated that the mean percentage mass loss increased as time increased. However, candidates needed to be clear which part of the data they were referring to if they referred to overlapping/ non-overlapping of the data. Vague responses were not creditworthy. Some candidates correctly identified specific parts of the graph where there was/wasn't overlap, but did not correctly explain the significance of this.

(i) Comment on the results of this investigation.

(3)

→ species A has higher 82 % loss in mass mean % loss in mass suggests higher enzymes works at optimum level than species B where the highest is at 16 % in 16 weeks

→ species B is weaker

→ sample size and

→ conditions given including temperature, humidity, size of fungus also needs to be taken account.

ResultsPlus
Examiner Comments

This response is awarded mark point 2.

(i) Comment on the results of this investigation.

(3)

* Fungus ~~B~~ A can digest a wider range / more different types of molecules, as it shows greater percentage loss in mass throughout investigation. The error bars ~~do not overlap so difference in digestion is ... % loss is significant~~ between the % of the two species do not overlap so difference is significant. Both species cause increase % loss of mass over time. There is overlap between error bars for ~~day~~ week 8 to 12 for species A so no significant difference. The error bars overlap for species B between 8 to 16 weeks so B only has ~~effect~~ significant effect between 4 and 8 weeks. The error bar ~~for 8 weeks~~ for A is larger ~~as least reliable~~ than B so not reliable. No inform...

ResultsPlus Examiner Comments

This response gains all three marking points.

Question 8 (b)(ii)

This question asks candidates to suggest one reason for the difference in breakdown of the wood by species A and B.

It was pleasing to see that a significant number of candidates used the first sentence of Q08(b) to help them to make a correct suggestion.

(ii) Suggest **one** reason for the difference in breakdown of the wood by species A and species B.

(1)

Species A has enzymes that break down the cell wall of wood (cellulose and lignin) while species B does not.

ResultsPlus
Examiner Comments

An example of a creditworthy suggestion.

(ii) Suggest **one** reason for the difference in breakdown of the wood by species A and species B.

(1)

given about number of fungi tested.

* A has ~~any~~ more types of hydrolytic enzymes and so can breakdown ~~&~~ more molecules.

ResultsPlus
Examiner Comments

An example of a creditworthy suggestion.

Question 8 (c)(iii)

This question asks candidates to explain the processes that could be used by a seedbank to conserve species D.

It is important to take careful note of the command word. It was disappointing that a significant number of candidates gave descriptions instead of explanations. The most common reason why marking point 1 was not awarded was that candidates did not grasp the importance of collecting from different individuals of species D. Marking points 2, 3 and 4 were the most commonly awarded points where candidates gave an explanation. Higher level responses explained the need to germinate seeds periodically, pollinate the adult plants and then collect new seeds.

(iii) Species D is an endangered plant species.

Explain the processes that could be used by a seed bank to conserve this plant species.

(3)

A large number of seeds from all across the world is obtained to have a large gene pool. Seeds are X-rayed for embryo viability and food stores. Surface of the seeds are sterilized and they are kept in dry and cold conditions to prevent activation of bacterial enzymes and seed enzymes and lowering their activity to prevent infection and germination

ResultsPlus
Examiner Comments

This response achieves full marks.

(iii) Species D is an endangered plant species.

Explain the processes that could be used by a seed bank to conserve this plant species.

(3)

harvest seeds from different plants of same species, and from different areas. This ensures genetic diversity and prevents the favourable alleles in the seeds. Seeds can then be kept using X-ray to ensure they remain viable. Before storing the seeds the seeds are dried to prevent germination of seeds, to prevent growth of microorganisms, to prevent enzyme activity and to extend storage time of seeds. The seeds are sprayed with antimicrobials, which will prevent damage to seeds. any micro-organisms to prevent infection. The seeds are frozen (stored under 0 degrees) and every now and then some seeds are taken out and allowed to germinate and grow into a adult plants, from these plants more seeds can be harvested, and new seeds can replace the frozen ones. once there is large number of seeds, plant species is reintroduced back into the wild.

(Total for Question 8 = 14 marks)

ResultsPlus
Examiner Comments

This response covers all of the available marking points.

Question 8 (c)(i)-(ii)

This question asks candidates to calculate the index of diversity, using the provided table and formula to help them.

It was pleasing to see that most candidates gave the correct answer. The most common mistake was using 7(7-1) as the numerator. The majority of candidates could recognise that habitat 1 had a higher biodiversity because the D value of 4.2 was larger than 3.1. However, a significant minority of candidates thought that species G was the correct answer. A small number of candidates correctly recognised that habitat 1 had a higher biodiversity, but did not give a reason for their answer. Candidates must ensure they have answered all parts of the question.

(c) A study compared the biodiversity of two woodland habitats.

The index of diversity for habitat one was 4.2.

The table shows the data obtained from habitat two.

Species	Number of individuals (n)	n(n–1)
A	34	1122
B	6	30
C	27	702
D	4	12
E	9	72
F	31	930
G	120	14280
	231	53130

(i) An index of diversity (D) is calculated using the formula:

$$D = \frac{N(N-1)}{\Sigma n(n-1)}$$

Calculate the index of diversity for habitat two.

Use the table and the formula to help you.

(3)

$D = \frac{53130}{1122+30+702+12+72+930+14280}$

$D = \frac{53130}{17148} = 3.0983205$

Answer 3.1

(ii) State which habitat has the higher biodiversity.

Give a reason for your answer.

(1)

habitate one have higher biodiversity

4.2 > 3.1

ResultsPlus
Examiner Comments

An example of a response which scores full marks.

(c) A study compared the biodiversity of two woodland habitats.

The index of diversity for habitat one was 4.2.

The table shows the data obtained from habitat two.

Species	Number of individuals (n)	n(n–1)
A	34	1122
B	6	30
C	27	702
D	4	12
E	9	72
F	31	930
G	120	14280
7	231	17141

(i) An index of diversity (D) is calculated using the formula:

$$D = \frac{N(N-1)}{\Sigma n(n-1)}$$

Calculate the index of diversity for habitat two.

Use the table and the formula to help you.

(3)

D = [illegible] $\frac{7(7-1)}{17141} = 0.0024$

[illegible]

Answer 0.0024

(ii) State which habitat has the higher biodiversity.

Give a reason for your answer.

(1)

habitat one, higher index of biodiversity.

ResultsPlus
Examiner Comments

An example of the common numerator error.

ResultsPlus
Examiner Tip

Make sure you know how to perform all the mathematical calculations listed in the specification.

Paper Summary

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

- Be prepared to both describe and draw structures that are listed in the specification.
- Read the questions carefully and take into account the command words as well as the context given.
- Learn how to do the types of calculations that are listed in the specification and check how many decimal places or significant figures that you should give in your final answer.
- Do not try and make a mark scheme you have learnt from a previous paper fit a different question with different command words and a different context.
- Use all of the information provided in the question to help you with your answer, for example diagrams, graphs and tables of data.

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