Pearson Edexcel

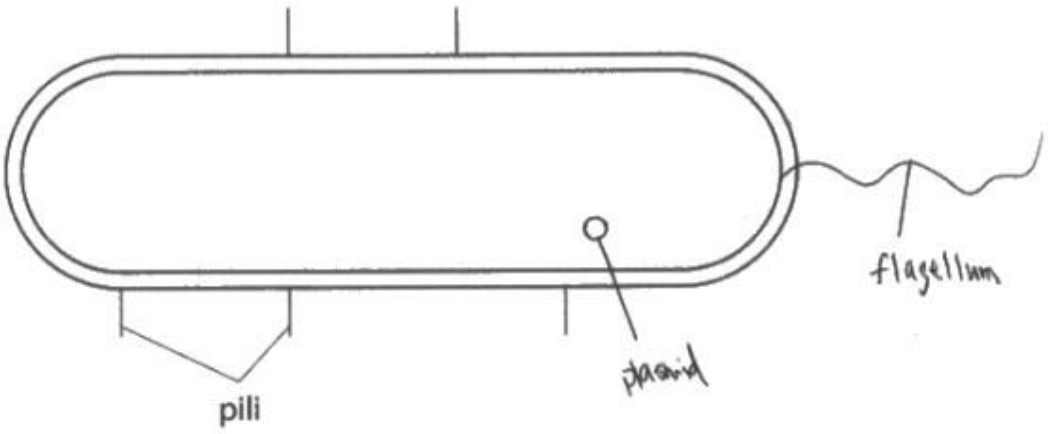
Examiners' Report
Principal Examiner Feedback

October 2022

Pearson Edexcel International A Level
In Biology (WBI12) Paper 01: Cells, Development, Biodiversity and Conservation

Question 1(a)
This multiple-choice question was answered correctly by most students.

Question 1(b)(i)
This question asked students to complete the diagram by drawing and labelling a flagellum and a plasmid.
Unfortunately, a small number of students left this diagram blank. Students need to look carefully to ensure they complete every question.
Where students did draw and label the two required structures, the plasmid mark was more commonly awarded. A significant number of students did not draw the origin of the flagellum on the cell membrane.
This is an example of a response which scored 2 marks:



Question 1(b)(ii)
This question asked students to state the function of a plasmid.
A wide variety of answers were seen. Some students confused a plasmid with plasmodesmata. Other students did not understand the term 'function' and simply stated what a plasmid was.
For example:

(ii) State the function of a plasmid.

(1)

Contain DNA

The most common correct response centred around plasmids containing genes for antibiotic resistance, for example:

(ii) State the function of a plasmid.

(1)

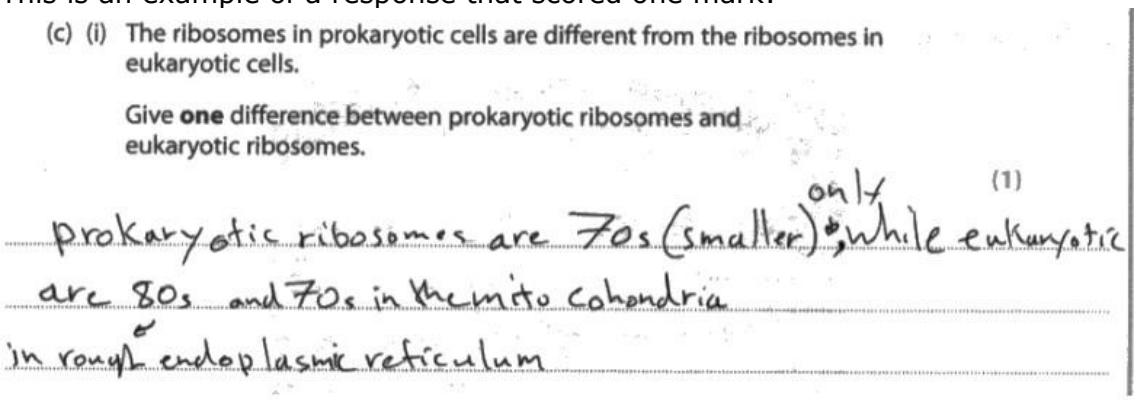
It contains genetic information of production for specific proteins, such resistance to ~~antibodies~~ antibiotics.

Question 1(c)(i)

This question asked students to give one difference between prokaryotic ribosomes and eukaryotic ribosomes.

Nearly all students could give a correct difference to gain the mark and some detailed answers were seen.

This is an example of a response that scored one mark:



(c) (i) The ribosomes in prokaryotic cells are different from the ribosomes in eukaryotic cells.

Give **one** difference between prokaryotic ribosomes and eukaryotic ribosomes.

(1)

prokaryotic ribosomes are 70s (smaller) only, while eukaryotic are 80s and 70s in the mito cohondria in rough endoplasmic reticulum

Question 1(c)(ii)

Some students found this question more challenging than Q1(a).

Question 2(a)

This question required students to use the given formula and data to calculate the upper surface area of the leaf. Most students gave the correct answer. The most common mistake was forgetting to convert the given diameter into the radius.

Question 2(c)(i)

This question asked students to complete the diagram by labelling one permanent vacuole.

Unfortunately, a small number of students left this diagram blank. Students need to look carefully to ensure they complete every question.

It was pleasing to see that nearly all students who did attempt this question could label a permanent vacuole onto the provided diagram.

Question 2(c)(ii)

This question asked students to give two functions of a vacuole.

Most students knew that the vacuole was involved in ensuring the turgidity of the plant cell. Fewer students knew what the vacuole liquid contained.

This is an example of a response which gained two marks:

(ii) Give two functions of a vacuole.

(2)

The vacuole is a membrane filled with water, it provides turgidity for the plant cells and helps plants maintain up-right. It is also a storage for ~~soluable~~ soluble substances such as sugars and minerals.

This response gained mp1 for maintaining turgor pressure, but the reference to containing cell sap was insufficient at this level for marking point two.

(ii) Give two functions of a vacuole.

(2)

It ~~carry~~ carries dissolved substances in a cell sap so that it ~~without~~ doesn't change ~~changing~~ the solute concentration inside the cell and it ~~maintaining~~ maintains turgor pressure.

Question 3(a)(i)

This response required students to describe the roles of magnesium ions and nitrates in the plants.

Most students knew the role of nitrates. However fewer students were able to give a full description of the role of magnesium ions.

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

(a) (i) The nutrient solutions contain magnesium ions and nitrates.

Describe the roles of these inorganic ions in the plants.

(2)

Magnesium ions used in the production of chlorophyll, so the production of glucose by photosynthesis.

Nitrates Used to make amino acids and thus proteins that are required for growth.

Question 3(a)(ii)

This question required students to suggest one advantage of the vertical system over the horizontal system.

Most students could identify that the vertical system would allow more plants to be grown in a given area, as shown in this example:

(ii) Suggest **one** advantage of the vertical system over the horizontal system.

(1)

Vertical system saves more space than horizontal system so more plants could be stored in one place

A small number of students thought a vertical system would allow more light energy to be absorbed by the plants on each level of the vertical system, which was not creditworthy.

Question 3(b)(ii)

This question asked students to give one conclusion for the provided data.
It was pleasing to see that most students could analyse provided information and give a correct conclusion.
Most answers centred around the increase in concentration of calcium chloride solution, but a significant number of conclusions were seen which referred to increasing the number of treatments.
A small minority of students did not refer to either concentration or number of treatments.
This is an example of a response which scored one mark:

(ii) Give **one** conclusion for this investigation.

(1)

The higher the calcium chloride concentration, the more firm the fruits are.

Question 3(b)(iii)

This question built upon their conclusion and required students to explain why the firmness of the fruits had increased.
Unfortunately, a small number of students did not take careful note of the command word and just described the data or restated their conclusion, for example:

(iii) Explain the effect of calcium ion concentration on the firmness of cherry fruits.

(3)

Calcium ion concentration increases the firmness of cherry fruits, the firmness increases as the number of treatments increase, the plants treated with a higher calcium ion concentration increase more rapidly than plants treated with a lower calcium ion concentration.

Where students did give an explanation, the most commonly awarded marking point was for the formation of calcium pectate. Most students continued to refer to the formation of the middle lamella. Fewer students could correctly explain why the formation of calcium pectate and the middle lamella would result in firmer fruits.

This is an example of a response which scored 3 marks:

(iii) Explain the effect of calcium ion concentration on the firmness of cherry fruits.

(3)

Calcium ions are needed to make calcium pectate, which is a sticky substance between cells to stick adjacent cells together. Cellulose microfibrils are also embedded into calcium pectate preventing them from sliding over each other, giving it high tensile strength as well as flexibility thus cherry fruits become firm. Increasing the calcium ion concentration means more calcium pectate is formed so cells are more firm.

Question 4(a)(i)

This question asked the students to explain the conditions that would result in the greatest bacterial growth on the surface of a chopping board.

It is very important that students take careful note of the command word. An explanation requires a justification / exemplification of a point.

Unfortunately, a significant number of students just stated conditions that would result in bacterial growth and didn't explain why. For example:

(a) (i) Bacteria can grow on the surfaces of chopping boards.

Explain the conditions that would result in the greatest bacterial growth on the surface of a chopping board.

(3)

A high temperature would cause backeria to grow rapidly aswell as a high pH level. Moreover, the moisture also affects the bacteria, for example if the board is left wet.

Higher level responses considered why each condition would be needed to result in the greatest bacterial growth. The most commonly awarded explanations centred around linking the optimum pH or temperature to the highest enzyme activity. However, frequent explanations linking oxygen and glucose to respiration were also seen.
This response scored full marks and gained mp1,3,4,5:

(a) (i) Bacteria can grow on the surfaces of chopping boards.

Explain the conditions that would result in the greatest bacterial growth on the surface of a chopping board.

(3)

- water for hydrolysis reactions
- oxygen for aerobic respiration
- optimum temperature for faster enzyme reactions
- optimum pH for faster enzyme reactions

Question 4(a)(ii)

This question asked students to explain why boards made from oil-based plastics are not considered sustainable.
Most students knew that oil was a finite resource and not biodegradable and therefore gained mp1 and mp2. Some students stated that the plastics were not recyclable, which was not credit worthy.
Mp3 was awarded less often than mp1 or 2.

Question 4(b)(i)

Students were provided with information about an investigation into the number of bacteria surviving on boards made from different materials.

This question required students to analyse the given information in order to comment on the results of the investigation.

Most students were able to identify that bacterial survival was the lowest on pine chopping boards or the converse for plastic chopping boards. Most could also make a correct comment for mp3.

Fewer candidates were able to achieve mp1. It is important to note that they need to make a clear statement of the general overall trend instead of writing 3 separate descriptions of the data.

Mp4 was seen on a smaller number of responses than mp1.

This response scored 3 marks:

(i) Comment on the results of this investigation.

(3)

- the number of bacteria is always ~~decreases~~ decreased after 24 hours
- the number of bacteria remained the same for 4 hours in the plastic chopping board but decreased in the pine and spruce chopping boards
- Pine chopping board has the lowest number of bacteria at 24 hours

Question 4(b)(ii)

Students were asked to suggest one reason for the difference in bacterial survival on the pine and plastic chopping boards.

This question tested specification point 4.11. It was pleasing to see that most students could give a credit worthy answer to this question. For example:

(ii) Suggest **one** reason for the difference in bacterial survival on the pine chopping board and on the plastic chopping board.

(1)

~~Pine~~ Pine chopping board contains some antimicrobial substances that are made by pine cells while plastic chopping board doesn't contain.

However, a significant minority of responses discussed conditions on the pine chopping board that would have resulted in higher bacterial survival.

Question 5(a)(i)

This question asked students to state what is meant by the term allele.

A significant number of students did not know what an allele is. Common incorrect answers were definitions of a locus, linkage, or the definition of a gene.

Question 5(a)(iii)

This question asked students to describe how a Rhesus antigen would be produced from its polypeptide chain and transported to the cell surface membrane.

This question told students that a polypeptide chain had been produced. It was surprising therefore that a significant minority of responses included transcription and translation in their answer, for example:

(iii) Rhesus antigens are glycoproteins.

Describe how a Rhesus antigen would be produced from its polypeptide chain and transported to the cell surface membrane.

(5)

DNA helicase unwinds and "unzips" DNA to form a sense strand and an antisense strand. RNA nucleotides line up at the antisense strand forming a RNA strand called mRNA. mRNA moves out of the nucleus through nuclear pores and they bind to ribosomes. The ribosome forms an amino acid sequence or polypeptide chain. tRNA joins up with the mRNA strand. tRNA carries the specific amino acid that ~~entry~~ codons code for. The tRNA it self has an anticodon which allows it to bind to the mRNA After the polypeptide chain is made, it moves to the Golgi apparatus. This is where ~~the~~ modifications are made to the polypeptide chain such as the addition of lipids to form glycoproteins or in this case Rhesus antigen.

Students need to take careful note of information they have been given to ensure they do not waste time or answer space on information that is not required.

Most students gained marking points 3 and 5 for a general description of a Rhesus antigen polypeptide being packaged into vesicles and travelling from rER to Golgi body, being modified and packaged into vesicles again and sent

to cell surface membrane. Fewer students gained mp4 as they did not describe how the protein would be modified in the Golgi apparatus. More detailed responses considered the content for mp1 and mp2.
This is an example of a response which gained 5 marks:

(iii) Rhesus antigens are glycoproteins.

Describe how a Rhesus antigen would be produced from its polypeptide chain and transported to the cell surface membrane.

(5)

Polypeptide chain will be produced on ribosomes attached to rER, after that it will enter the lumen of rER and there it will get folded into it's 3D Shape. rER will then ~~transport~~ package the protein into a transport vesicle and it will travel to golgi. the ~~vest~~ transport vesicle will fuse with the membrane of golgi. then golgi will modify the protein ~~to~~ by the addition of carbohydrates to form glycoproteins after modification golgi will package the glycoprotein into a secretory vesicle and it will bud of the membrane of golgi and make it's way to the cell surface membrane. it can bud of the cell surface membrane by exocytosis or it can remain in the cell membrane as a glycoprotein

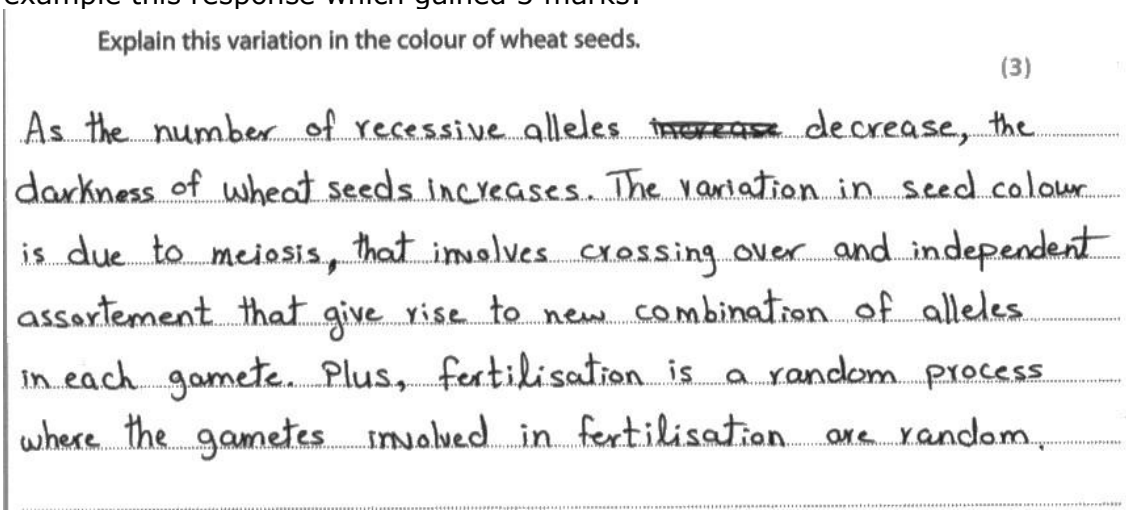
Question 5(b)

This question provided students with an example of polygenic inheritance. Students were provided with information which they needed to analyse. They were then asked to explain this variation in the colour of wheat seeds. It was disappointing that many students did not take note of the command word and just gave description answers.

Most students achieved mark point one. The most common answers referred to either intermediate red having the highest frequency or linking the number of recessive/dominant alleles to the colour of the seed.

More detailed responses considered why there was this normal distribution and considered the probability of getting a certain genotype or the variation in the gametes.

A small number of students considered random fertilisation of gametes, for example this response which gained 3 marks:



Explain this variation in the colour of wheat seeds.

(3)

As the number of recessive alleles ~~increase~~ decrease, the darkness of wheat seeds increases. The variation in seed colour is due to meiosis, that involves crossing over and independent assortement that give rise to new combination of alleles in each gamete. Plus, fertilisation is a random process where the gametes involved in fertilisation are random.

Question 6(a)(i)

This question asked students to state the types of cell division occurring at 2 steps on the given diagram.

This question was answered well with most students gaining 2 marks.

Question 6(b)

Students were asked to explain what happens at step D for the cell to become a specialised sperm cell.

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

A small number of students explained the process of a sperm cell fertilising an egg cell which was not credit worthy.

Many good explanations were seen which addressed marking points 1-4. However, marking point 5 could only be awarded if the response explained how the protein would cause a structural or functional change into a sperm cell. Vague statements which did not apply to the context of the question were not creditworthy.

Centres are reminded of the importance of applying answers to the given context.

This is as example of a response which scored full marks:

(b) A sperm cell is a specialised cell.

Explain what happens at step D for the cell to become a specialised sperm cell.

(5)

- differential gene expression occurs by DNA methylation which switches off a gene after that the transcription of active mRNA genes leads to the translation of active mRNA in the ribosomes after that a specific protein is synthesised which permenantly modifies the cell's structure and function and then it synthesises the production of the acrosome

Question 6(c)(i)

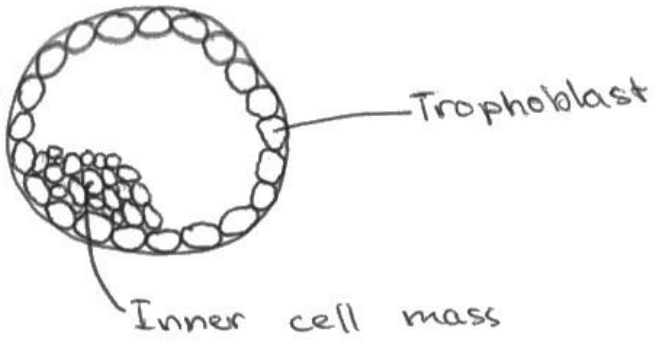
This question asked students to draw a diagram to show the arrangement of the cells of a blastocyst.

It was pleasing to see so many good drawings, often with additional details such as the correct labels, for example:

(c) The nucleus of a sperm cell fuses with the nucleus of an egg cell to form a zygote. The zygote develops into a blastocyst.

(i) Draw a diagram to show the arrangement of the cells of a blastocyst.

(2)



Question 6(d)

This question asked students why the use of stem cells taken from salamander embryos was approved by an ethics committee.

Many students did not read the question carefully and thought that the cells were being taken from adult salamanders which would regenerate the damaged limb.
Where students recognised that the cells were stem cells taken from embryos, they usually gave a response including marking point 1 and 2.
Some more detailed responses included mp4.
Marking point 3 was usually awarded for the additional guidance, for example in this response which scored 2 marks:

Salamanders can regenerate damaged limbs and organs throughout their lives.

An ethics committee has approved the use of stem cells taken from salamanders.

Suggest why the use of stem cells taken from salamander embryos was approved.

(2)

Salamanders are n't at risk of extinction, and only a cell from the embryos can divide to form a tissue line) provide many stem cells, so there's less harm. The need of stem cells for organ transplant & treat more diseases. less ethical objections since no one cares about salamanders.

Question 7(a)

Most students could correctly state what is meant by the term species richness.
The most common mistake was to refer to the number of a species in a habitat.

Question 7(b)

This was the first of the level-based questions on the paper.
Students were provided with a range of information to analyse, and they were expected to use this information to support their answer.
The question had two parts. Students were asked to describe how the new cichlid species may have been formed in the lakes and how the scientists would have determined there were 6 different species.
The most common errors in weaker responses were not to use all the provided information on page 23 or only answer one part of the question. The most common errors in the higher mark range were to explain how molecular phylogeny could be used to show they were the same species or just stating that molecular phylogeny would be used to show they were different species without explaining how.
Most students achieved level one by giving a basic description of new species formation. A common answer included a description of how different selection pressures would have led to different alleles giving a selective advantage in different lakes.
This is an example of a low level one response:

Describe how new cichlid species may have been formed in these four lakes and how the scientists would have determined that these cichlids were six different species.

Use the information in the question and your own knowledge to support your answer.

(6)

Species adapt for survival. the advantageous alleles that enabled survival are passed onto offspring that allow genetic variation and new species to form.

Most students achieved level two by giving a basic description of new species formation and a basic description of determination of the new species. For example, describing that scientists would use molecular phylogeny to determine that the cichlids were six different species in addition to the level one criteria.

However, a significant minority achieved level 2 by giving a detailed description of new species formation and not addressing the second part of the question, for example:

(6)

Geographical isolation and reproductive isolation, where a new geographical barrier appears in this case an eruption causing a crater lake, so no gene flow between the population, mutation occurs as, the population has split

as the different populations are being encountering different selection pressure causing different mutations where the fish with advantageous allele will live and pass on the advantageous allele, increasing allele frequency due to natural selection, which could allow evolution into different species due to different behavioral, physiological adaptations.

Level three was awarded for a detailed description of both new species formation and how they would have determined that the cichlids were 6 different species. Some students only achieved the lower mark as they described how scientists would use the information to see if they were the same species which was not the correct context.

This is an example of a response which achieved level 3:

Describe how new cichlid species may have been formed in these four lakes and how the scientists would have determined that these cichlids were six different species.

Use the information in the question and your own knowledge to support your answer.

(6)

There is geographical isolation which leads to the reproductive isolation. The populations of the fish are seperated by a geographical barrier such as the craters from volcanoes so they occupy different niches where there is no gene flow between the species. There are different mutation so introducing new alleles in each population. They face different selection pressures. Fish with advantageous alleles.

survive leading to the survival of the fittest. Where the surviving fish rep breed and pass on the favourable allele to coming generation. Thus, increasing the frequency of advantageous allele in the population. ~~Thus~~ There is a change of allele frequency by natural selection, where members of the same species become so different that they can longer interbreed with other fish to produce fertile offspring, leading to speciation. Scientists use molecular Phylogeny where they analyse the ~~dif~~ ~~seq~~ sequence of bases in the DNA and compare the similarities and differences

Question 7(c)

This question asked students to determine which of the lakes has the higher biodiversity of cichlids. They were told to use the table and formula provided. This question proved to be a good differentiator and the full range of marks was awarded.

It was pleasing to see a significant improvement in the number of students showing their working, which resulted in more marks being able to be awarded.

Most students were able to calculate and subsequently substitute the numerator and denominator into the given formula correctly to gain marking points one and two. A small number of students did not include *A. zaliosus* and therefore lost mp2.

Most students gained mp3 for a correctly calculated answer. ECF was awarded for those students who dd not include *A. zaliosus* and therefore had an incorrect denominator, for example:

Species	Number of individuals (n)	n(n – 1)
A. astorquii	156	24 180
A. chancho	45	1 980
A. flaveolus	78	6 006
A. globosus	8	56
A. supercilius	17	272
A. zaliosus	12	
	N = 316	$\sum n(n-1) = 324\,904$

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

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

Determine which of the lakes has the higher biodiversity of cichlids.

Use the table and the formula to help you.

(4)

$D = \frac{99540}{324904} = 3.1$

lake

Lake Xpha had [redacted] index of diversity 2.8 < 3.1

Lake Apanye had more diversity

Unfortunately, some students lost mp3 because of incorrect rounding.
The majority of students could use their calculated answer to determine which of the lakes had the higher biodiversity. ECF was applied for a correct statement based on incorrect D values.
This is an example of a response which scored 4 marks:

(c) A study compared the diversity of cichlid species in two crater lakes.

The index of diversity (D) for Lake Xiloá was 2.8.

The table shows the data obtained from Lake Apoyo.

Species	Number of individuals (n)	n(n – 1)
A. astorquii	156	24180
A. chancho	45	1980
A. flaveolus	78	6006
A. globosus	8	56
A. supercilius	17	272
A. zaliosus	12	132
	N = 316	$\sum n(n-1) = 32626$

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

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

Determine which of the lakes has the higher biodiversity of cichlids.

Use the table and the formula to help you.

(4)

$$\frac{316(316-1)}{32626} = \frac{99540}{32626}$$

$$= 3.05$$

Lake Apoyo has a higher biodiversity of ~~et~~ cichlids

Question 7(d)

This question gave students information from two studies and asked them to determine if allele frequencies had changed using the given equations.

Many students could calculate 128÷800 to be 0.16 to gain mp1. Unfortunately, a significant majority thought that this was q instead of q^2. Therefore, they stated that the allele frequencies had changed.

For example, this response which scored two marks (mp1 and mp3 ECF):

Determine if the allele frequencies have changed, using the equations:

$$p^2 + 2pq + q^2 = 1$$

$$p + q = 1$$

(3)

672+128=800

$\frac{672}{800} = 0.84$, $\frac{128}{800} = 0.16$ $0.84+0.16=1$

Yes, the allele frequencies have changed. From 0.6 & 0.4 to 0.84 & 0.16.

This is as example of a response which scored 3 marks:

In a later study, 672 fish of this species were gold and 128 were melanic.

Determine if the allele frequencies have changed, using the equations:

$$p^2 + 2pq + q^2 = 1$$

$$p + q = 1$$

(3)

$q^2 = \frac{128}{672+128} = 0.16$

$q = \sqrt{0.16} = \boxed{0.4}$

$p + q = 1$ so $1 - 0.4 = p$

$\boxed{p = 0.6}$

so allele frequence has not changed.

Question 8(a)

This response asked students to describe the role of the cell cycle in producing new cells.

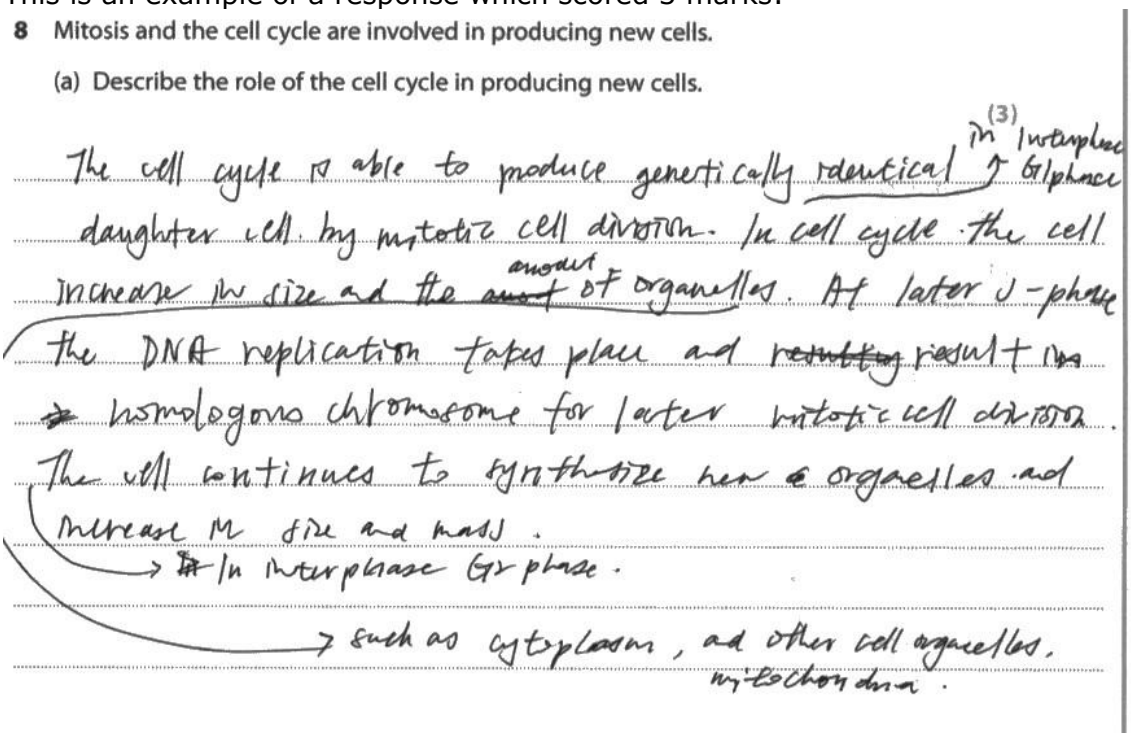
Some students did not understand the term 'role' and did not take note of the introductory sentence before the question. They gave detailed descriptions of the stages in mitosis.

Most students could describe the replication of DNA and the formation of new organelles. However fewer students described the growth of the cell.
This is an example of a response which scored 3 marks:

8 Mitosis and the cell cycle are involved in producing new cells.

(a) Describe the role of the cell cycle in producing new cells.

(3)



Question 8(b)

This question asked students to explain why increased methylation of this gene could cause the growth of a tumour.
It was pleasing to see a large number of responses which correctly explained how a gene would be methylated and therefore gained mp1.
Similarly, the majority of responses showed that students knew the consequences of this methylation on gene expression, transcription and translation.
Fewer responses linked back to the context of the question and explained that fewer/no RB or tumour suppressor proteins would be produced and why this would result in the growth of a tumour. It is important that students consider the context carefully when structuring their answers.
This is an example of a response which scored full marks:

Explain why increased methylation of this gene could cause the growth of a tumour.

(4)

increased methylation causes a methyl group to be added to a cytosine base next to a guanine base by enzyme DNA methyltransferase. So methyl group physically blocks transcription factors and RNA polymerase from binding to promoter, so transcription of the tumor suppressor gene is (is) can not be initiated, so gene is silenced ad RB protein can't be produced during translation as mRNA can't be formed. So ~~tumor~~ tumor growth not inhibited.

Question 8(c)

This question provided students with information about a drug which prevented the shortening of spindle fibres.

The students were asked to explain how preventing the shortening of spindle fibres affects mitosis.

This question was answered well by the majority of students, with nearly all students gaining mp1 and a majority gaining two marks. Some students did not give the stage of mitosis in their explanations and therefore did not gain mp2.

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

(c) The cell cycle can be affected by various chemicals.

One drug, used to treat various types of cancer, prevents the shortening of spindle fibres.

Explain how preventing the shortening of spindle fibres affects mitosis.

(2)

If spindle fibres can't be shaten, then it affects anaphase by not allowing the chromatids to seperate, as a result no mitosis occurs and no formation of cell. This ~~is caused due to~~ No anaphase stage occurs as a result of this.

Question 8(d)

This was the second of the level-based questions on the paper.

Students were provided with a range of information to analyse, both qualitative and quantitative, and they were expected to use all this information to support their answer. Students who only used the graph for example would have limited the mark they could achieve.

Higher level responses used all the given information and their own biological knowledge to evaluate the effectiveness of paclitaxel.

A significant minority of responses thought that Paclitaxel increased lung cancer.

When students analyse SD bars on a graph, it is not sufficient just to comment on either their size of the presence /absence of an overlap. It is important that they explain the significance of this.

Level one was usually achieved through a basic evaluation of either the table or the graph, for example:

Evaluate the effectiveness of paclitaxel.

Use the information given to support your answer.

(6)

The paclitaxel was the most effective upon the other treatments used and the placebo was the least effective when using a paclitaxel the mean increase in mass of tumour / g decreased thus showing its effectiveness and it is ready to go with Phase 1 that is trying it on healthy patients
the placebo was the least effective as there was no treatment thus showed the greatest mass / g.

When students correctly evaluated both the table and the graph, they could access level two, for example this response which scored 4 marks:

Evaluate the effectiveness of paclitaxel.

Use the information given to support your answer.

(6)

As the concentration of paclitaxel increases, the duration of ~~mitot~~ mitosis increases and the mitotic index of cancerous cells in lung tissue ~~decreases~~ increases. For example, when concentration of paclitaxel increases from 0 to 10 $nmol\,dm^{-3}$, the duration of mitosis increased by 3 hours and the mitotic index increases by 15 %. The paclitaxel treatment was the most effective treatment compared with placebo and drug X to treat breast tumour, as paclitaxel showed the greatest decrease in the mean increase in mass of tumour after 21 days. The difference of the effect of paclitaxel with drug X and placebo on mean increase in mass of tumour, is significant, as the error bars of paclitaxel and drug X do not overlapp.

More detailed evaluations of all the given data allowed access to level three. Some excellent responses picked up on the drug mentioned in 8(c) and used this to add depth to their evaluation.
This is an example of a response which achieved level 3:

Evaluate the effectiveness of paclitaxel.

Use the information given to support your answer.

(6)

In the first study, as concentration increase, the mitosis duration increase increasing mitotic index. This helps increase the time taken for cancerous cells to form thus decreasing the probability of lung cancer as there is more control on cell division than before. In study 2, it showed that both drugs showed decrease in the tumour mass increase rate whereas the placebo was used as control for comparison. Paclitaxel showed the most decrease in the rate of tumour mass increase with a significant different from placebo where the drug X showed decrease in tumour mass rate but not as effective as Paclitaxel with but without a significant difference with placebo.

Paper summary

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

- Read the whole question carefully, including the introduction, to help relate your answer to the context asked.
- You should take into account the command words as well as the context given. Answers which do not match the command words or do not relate to the given context will not gain high marks.
- Information provided in the introduction to questions is provided for a specific reason. Read it carefully and analyse what information will be needed to provide a high-level response to the question being asked.
- Some questions specifically state 'use information in the question to support your answer'. This refers to more than just quantitative data.
- Do not try and make a mark scheme you have learnt from a previous paper fit a different question with different context and command words.
- Study all of the mathematical skills in the specification which could be tested at this level.
- Make sure you include your working with all calculations. Give relevant units where applicable. If rounding is necessary, make sure that this is done correctly.