

Student answers for part a) i)

Student answer A

- (a) (i) Give two reasons why a cold solution containing sucrose and a buffer was used in this investigation.

(2)

Sucrose - keep water potential constant

Buffer - keep pH levels 'constant' ; they will change a bit

Examiner comments

[comment text]

This response needs to be qualified with reference to the consequences for the chloroplasts and enzymes in order to gain Mp1 and Mp2.

Mark awarded = 0

Student answer B

- (a) (i) Give two reasons why a cold solution containing sucrose and a buffer was used in this investigation.

(2)

Cold solution so no enzymes will ~~denature~~.

would denature. Also, the cell membrane

of palisade cells containing the chloroplast

(which contains the chlorophyll) will be broken down.

Examiner comments

[comment text]

This response refers to the cold solution only and the consequence for enzymes, so Mp1 can be awarded.

Mark awarded = 1

Student answer C

- (a) (i) Give **two** reasons why a cold solution containing sucrose and a buffer was used in this investigation.

(2)

It needs to be cold to stop denaturation of enzymes.
& A sucrose solution is needed to stop the chloroplast from bursting changing shape due to osmosis.

Examiner comments

[comment text]

This response has a clear reference to both the conditions in the question and they are correctly qualified.

Mark awarded = 2

Student answers for part a) ii)

Student answer A

- (ii) Give a reason why tube 3 was used in this investigation.

(1)

To ensure ^{results} effects were actually due to light's presence

Examiner comments

[comment text]

This is a vague response with no reference to control and the effect on DCPIP.

Mark awarded = 0

Student answer B

- (ii) Give a reason why tube 3 was used in this investigation.

(1)

As a control

Examiner comments

[comment text]

To be worthy of a mark the response requires both a reference to control and the effect on DCPIP.

Mark awarded = 0

Student answer C

(ii) Give a reason why tube 3 was used in this investigation.

(1)

tube 3 is a control to check that SPIP does not change on its own.

Examiner comments

[comment text]

This response has a clear reference to the control and why it is needed.

Mark awarded = 1

Student answers for part a) iii)

Student answer A

Explain how the student modified the practical procedure of the first investigation to enable these results to be obtained.

(4)

- set up lots of tube 1
- shine green light on one set of tubes, blue light on another set and blue on another.
- use coloured filters or coloured light bulbs but the same wattage.
- measure the absorbance for every minute for six minutes
- calculate the mean absorbance for each wavelength of light

Examiner comments

[comment text]

This response gains Mp1 for the first bullet point and Mp3 for the second bullet point. Mp2 can be awarded for the reference to "lots" in the first bullet point and the calculation of a mean for each wavelength in the fourth bullet point.

Mark awarded = 3

Student answers

Student answer A

Analyse the data to evaluate whether these results support this conclusion. (6)

The conclusion is not fully supported by these results. It is supported by the results shown by the slow twitch fibres. The activity of ATPase greatly reduces after a peak at the age of 10 months, falling from 1.04 au to 0.82 au in a space of 18 months. In contrast to this the amount of ATPase activity in fast twitch fibres drops 0.04 au from a peak at 10 months.

Examiner comments

[comment text]

This response has a very good opening sentence but it goes on to make only limited reference to both sides of the argument with little supporting evidence. This is sufficient for level 2. However, the argument is not sustained so level 3 is not reached.

Mark awarded = 3

Student answer B

The membranes in these fibres contain the enzyme Ca-ATPase which is involved in the transport of calcium ions.

The scientists concluded that in older muscle it takes longer to restore the calcium ion balance.

Analyse the data to evaluate whether these results support the scientists' conclusion.

(6)

overlap. up to

~~The data is only about ATPase activity and this doesn't necessarily affect calcium ions. Also the activity increases from 5 to 10 months in both types of fibre and the error bars~~
The data doesn't support the conclusion because there could be fewer slow fibres as it ages. There's no data on the ratio of the two fibres changing. So it doesn't support as there could be fewer slow fibres as it ages. The data does support the statement because although the activity in fact is constant from 16 to 28 months but it decreases by 0.04 a.u. So with less enzyme activity the calcium ion balance will take longer.

Examiner comments

[comment text]

This response makes several references to clearly expressed, evidence from the data that supports and does not support the conclusion. Some statements are outside the indicative content but are still creditworthy in the context of the data e.g. reference to number of fibres changing with age. There is sustained reference to the data in the graph which is analysed e.g. error bars. This is clearly worthy of level 3 and a mark of at least 5 is appropriate.

Mark awarded = 5

Student answers for part a)

Student answer A

(a) Explain how this molecule of mRNA is produced.

(4)

The pre mRNA is spliced, ~~and~~ exons ~~are~~ bonded back together and introns are removed.

Examiner comments

Answers need to give details of what happens at each step in the diagram. Details of splicing need to be given; therefore this response only gains Mp5 for the removal of the introns.

Mark awarded = 1

Student answer B

(a) Explain how this molecule of mRNA is produced.

(4)

Double stranded DNA will be opened up by helicase and RNA nucleotides will pair themselves with the sequence on the template strand. After pairing, pre-mRNA will detach and double strand of DNA reforms. Pre-mRNA containing introns will be modified and introns will be removed and left over to undergo translation.

Examiner comments

This response gains Mp1 as 'opened up' is just equivalent to unzips and 'template' is mentioned on line 3. Mp5 is awarded for the reference to introns being removed on line 5. Mp2 cannot be awarded as there is no reference to complementary bases.

Mark awarded = 2

Student answer C

(a) Explain how this molecule of mRNA is produced.

(4)

The DNA is unzipped and nucleotides line up on the template strand. ^{by complementary pairing of bases.} RNA polymerase joins the nucleotides together to produce the pre-mRNA. This molecule is a complementary copy of all the introns and exons in the gene.

Then nucleases remove the bases in the introns and the exons are spliced together. This produces the mRNA by post-transcriptional modification.

Examiner comments

This response contains good detail of what happens at each stage and can be awarded Mps1, 2, 3 and 5.

Mark awarded = 4

Student answers for part b)

Student answer A

The diagram shows how 1 gene can code for ^{and transcribe} more than one mRNA and therefore more than one protein can be ~~transcribed~~ ^{translated} from a single gene. So there will be fewer genes than proteins.

Examiner comments

Mp2 and Mp3 are clearly stated.

Mark awarded = 2

Student answer B

Explain how the formation of mRNA, shown in the diagram, might account for this.

(5)

The early idea that one gene codes for one polypeptide meant that about 100,000 genes would be needed. The human genome project has shown that the number of genes that are needed is fewer. That's because one gene can code for more than one polypeptide. The diagram shows that two different mRNAs can be produced if not only the introns are removed but some of the exons as well. One molecule has 3 exons missing and the other has 4 exons removed. There could be another mRNA with no exons removed. They would all be translated into different polypeptides. (Total for Question 9 = 9 marks)

Examiner comments

This response can be awarded Mps 1, 2, 3 and 4 as the reference to polypeptide is equivalent to protein. There is no reference to the term post-transcriptional change.

Mark awarded = 4