

# **L3 Lead Examiner Report 2001**

January 2020

**L3 Qualification in Applied  
Human Biology**

**Unit 1: Principles of Applied Human  
Biology (21325L)**

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January 2020

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### What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

### Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

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Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

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### Unit 1 Principles of Applied Human Biology (21325L)

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	10	20	34	49

## Introduction to the Overall Performance of the Unit

This is the second sitting of this unit and it is clear that learners have continued to use the Sample Assessment Materials as well as the past examination paper in order to prepare for this unit as there were some very good quality answers seen, especially for the extended open response questions worth either 6 or 9 marks.

Questions on topics that will be more familiar to learners from their study of Biology at Level 2 were well answered with learners providing some thorough and thoughtful responses concerning coronary heart disease, the structure and function of the respiratory system and the principles of inheritance and genetics.

There was a general lack of understanding surrounding the principles of cell-based immunity with the majority of learners displaying some confusion about how this process occurs within the human body. It is vital that this topic is thoroughly understood as content surrounding immunology makes up a significant part of the specification for this unit.

Throughout the paper learners demonstrated a good ability to recall information from familiar contexts and to apply this information to similar situations. Where links needed to be made between different contexts so that learners were able to apply their knowledge this posed more of a challenge.

In several cases learners were let down by not being able to respond correctly to the command word in the question. It is important that learners understand that a description of a process or set of data cannot be awarded full credit if the question requires an explanation. For full marks to be awarded there must be an identification followed by subsequent expansion points – this could be seen particularly where learners were asked to explain a trend on a graph and instead the majority simply provided a description of the trends.

## Individual Questions

### Question 1ai

Many learners correctly identified the node of Ranvier from the diagram. A common misconception was that the label referred to the myelin sheath although the other two incorrect responses were also seen.

### Question 1aii

A common misconception here was that the feature labelled X in the diagram acted as a site for the binding of neurotransmitters. The response below shows the correct answer and was awarded the mark

(ii) Identify the function of the feature labelled X.

<input type="checkbox"/>	<b>A</b> allows for connection to other neurones
<input type="checkbox"/>	<b>B</b> is the binding site for neurotransmitters
<input type="checkbox"/>	<b>C</b> protects the nerve cell from damage
<input checked="" type="checkbox"/>	<b>D</b> speeds up impulse transmission

### Question 1aiii

In many cases learners could identify the function of the sodium potassium pump in relation to transmission of the nerve impulse, although in many cases their expansion on this point was too vague to be awarded credit. A relatively common response which was not worthy of credit gave the role of the sodium potassium pump in osmotic regulation – as this is not correct within the context of the question these responses could not be credited. The response below scored zero marks.

**Sodium-potassium pumps**

SODIUM - POTASSIUM PUMPS  
IN THE CELL MEMBRANE TO HELP  
MAINTAIN THE OSMOTIC POTENTIAL  
OF THE CELL.

**Mitochondria**

ALLOWS THE SIGNALS TO PASS  
THROUGH FASTER AND SENDS THEM TO THE  
RIGHT PLACE.

Most learners identified the role of the mitochondria in providing energy but in a large number of responses the idea that the energy provided by the mitochondria was transferred as the action potential itself was seen as an expansion point which demonstrates confusion about how the action potential is transmitted. A commonly seen phrase described the mitochondria as the “powerhouse of the cell” without further elaboration. This kind of descriptive language can be useful in helping develop an understanding the function but is not sufficiently clear to be awarded credit as a response in an exam. Learners should aim for simple, clear language when providing answers to questions such as these to make sure their meaning is not lost.

The following response was awarded three out of four possible marks. The explanation of the role of the sodium-potassium pumps is of a very good quality and provides even more detail than would be required for both of these marking points. One mark has been awarded for identification of the function of the mitochondria in provision of ATP but the second marking point for this section could not be awarded as the expansion is too vague and does not link to the use of the ATP within the transmission of the nerve impulse.

### Sodium-potassium pumps

Sodium-potassium pumps are in a 3:2 ratio to ensure the membrane can be repolarised after being depolarised, as well as allowing the nerve impulse to travel at a fast speed.

### Mitochondria

Mitochondria is where respiration takes place providing the cell with lots of ATP which speeds up the functioning of the cell allowing the transmission of the nerve impulse to be quick.

## Question 1b

The majority of learners answered this question correctly providing the brain or the spinal cord as a response. In a few cases the answers of "spine" was given which is not sufficiently clear as to be given credit as this may refer to the bones of the spine instead.

## Question 2a

This question was generally answered very well with most learners correctly completing at least two out of the three missing words from the paragraph.

The response below was awarded two marks, the learner has correctly identified the second and third missing words but has confused the diaphragm for the lung itself for the first mark.

At the start of inspiration the lung flattens.

Then the external intercostal muscles contract,

causing the rib cage to expand.

This was a relatively common incorrect response. Other commonly seen incorrect answers involved learners mixing up the expansion and contraction of the rib cage and the intercostal muscles.

The response below scored all three marks.

At the start of inspiration the diaphragm flattens.  
Then the external intercostal muscles contract,  
causing the rib cage to expand.

### Question 2bi

This question was answered well with most learners awarded both marks for correctly identifying the effect on the breathing rate and explaining the cause of this within the context of COPD.

The following response gained both marks – the learner has identified the increase in respiratory rate and has correctly explained why COPD leads to this response in the patient.

If there is decreased oxygen levels in the blood then the respiratory system has to work harder and faster to replace the missing oxygen resulting in an increased respiratory rate.

The response below was awarded one mark. The learner has correctly identified the decreased oxygen levels in the blood but has described the effect on the respiratory rate as breathing heavily rather than rapidly – this isn't a clear enough description of the rate and so is not awarded the mark.



Due to the disease of patient B they are breathing heavily to make up for the decreased amount of oxygen levels in the blood.

### Question 2bii

This question was answered well in many cases with most learners awarded the mark for a correct answer. A common incorrect response was that COPD causes low blood pressure.

### Question 2biii

Correct answers were common for this question with no single incorrect response being seen more frequently than the others.

The following response was awarded the mark as although the learner had initially selected the wrong answer of bronchioles they clearly indicated that this answer should not be accepted by crossing through the box and then selecting the correct answer of alveoli.

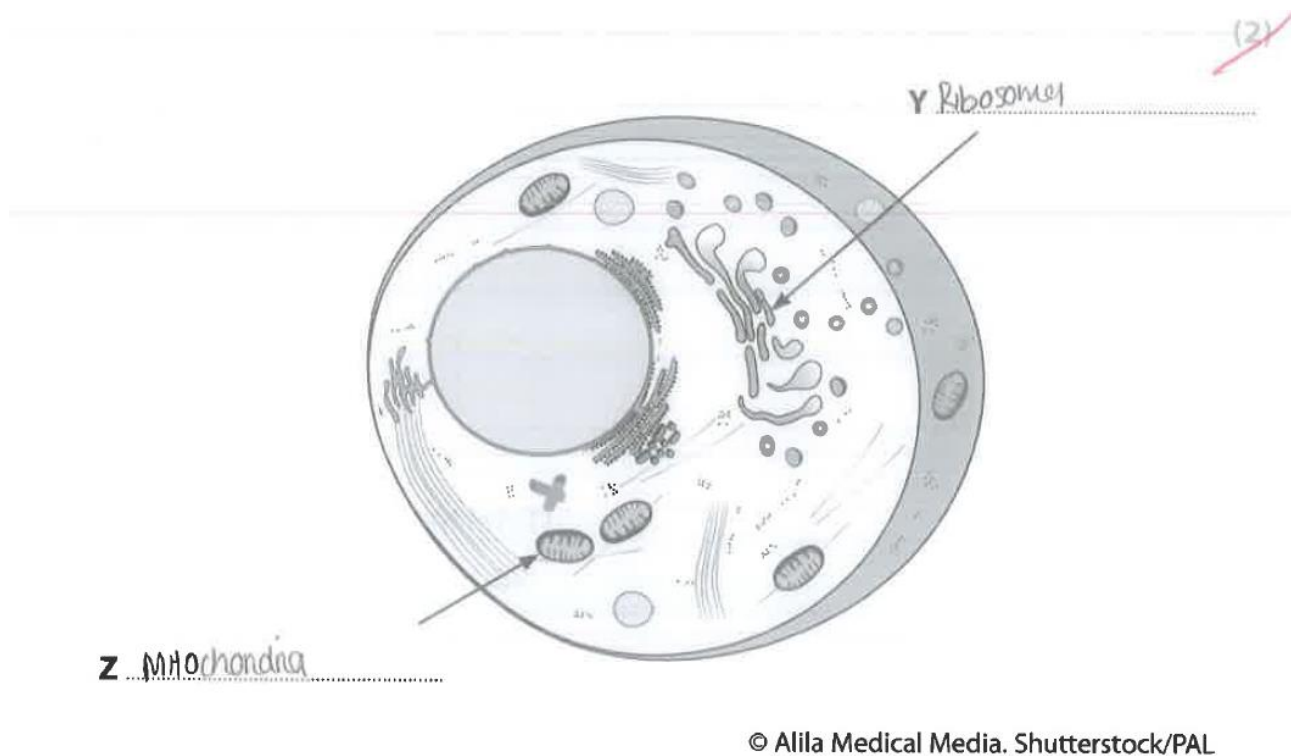
<input checked="" type="checkbox"/>	<b>A</b> alveoli
<input checked="" type="checkbox"/>	<b>B</b> bronchioles
<input type="checkbox"/>	<b>C</b> bronchus
<input type="checkbox"/>	<b>D</b> trachea

### Question 3a

The vast majority of learners correctly identified structure Z as the mitochondrion with very few incorrect responses seen. The identification of structure Y proved more difficult with fewer correct responses seen. A common incorrect response

here was “ribosomes”. References to rough and smooth endoplasmic reticulum were seen here also.

This response was awarded one mark for correct identification of the mitochondrion as structure Z.



### Question 3bi

The question requiring an explanation of the function of a glycoprotein within the cell membrane proved difficult for the majority of learners. In many cases this was left blank with no answer attempted. The most commonly seen answer was that the glycoprotein had role in cell signalling but there was often no expansion accompanying this. Statements that the glycoproteins provided “strength” or “structure” were seen often.

There was a common misconception that the glycoprotein controlled which substances could enter or leave the cell, this was seen fairly frequently and in some cases carried on to the answer for the next question.

An example of a response demonstrating this misconception is below. The learner has confused the role of the glycoprotein with that of the protein channel. This response scored no marks.

Glycoproteins allow for the transport of e.g. Glucose into a cell due to it being a larger molecule and not being able to flow through a passive channel. Glycoproteins are carrier proteins.

The response below was a rare example which scored both marks. Although the wording does not exactly match the expected answer from the mark scheme the description provided is sufficient to indicate the idea of recognition of self vs non-self cells within the body which is an acceptable expansion from the identification of the role in cell recognition.

Glycoproteins are important for cell recognition. They are a way for other cells in your body to know/recognise that they belong to you. Your glycoproteins are specific to you.

### Question 3bii

The six mark extended open response question provided many excellent demonstrations of thorough understanding of this section of the specification. Learners who were given five or six out of the total six marks provided thorough explanations of several different methods of transport across the cell membrane and linked the control of these methods to the structure of the membrane itself as well as the nature of the substance transported.

The following response scored in level 3 of the mark scheme – the learner has shown an appreciation of the wide variety of ways in which substances can be transported across the cell membrane. There is evidence of a strong understanding around the circumstances in which each method of transport would be appropriate and a good level of detail in their explanations.

The cell membrane controls the movement of substances into and out of the cell using carrier proteins, channel proteins and active transport. Carrier proteins ~~allow~~ <sup>control</sup> substances like amino acids and glucose going into and out of the cell; the molecules attach to the carrier protein and it changes shape, releasing the molecule on the other side ~~against~~ it across its concentration gradient. Channel proteins allow for the movement of ions like sodium into and out of the cell down its concentration gradient. These both of these methods are examples of facilitated diffusion. Finally, active transport is used to move substances against its concentration gradient, using ATP as an energy source by hydrolysing it to ~~release energy~~, moving molecules into and out of the cell. Lipid soluble substances can also diffuse across the membrane, water soluble substances can't due to the hydrophobic tails in the membrane.

(Total for Question 3 = 10 marks)

The response below is an example of a learner who scored in the second level for this question. The response gives an overview of several different methods of transport across the cell membrane and provides some detail for each. There are

some incorrect elements of the science here, in particular the need for ATP in facilitated diffusion but there is sufficient evidence of understanding seen to meet the criteria of level 2 on the levels based mark scheme.

The cell membrane is made of a phospholipid bilayer which is difficult to pass through as many proteins are hydrophobic. To allow molecules in or out the cell membrane has channel proteins, carrier proteins, potassium pumps and sodium-potassium pumps. The channel proteins let in small molecules where as bigger molecules like glucose have to pass through using the carrier protein which uses ATP as it is facilitated diffusion. The sodium and potassium pumps also use ATP to control the amount of sodium and potassium entering and exiting the cell. Each time 3 sodiums leave the cell and 2 potassiums enter the cell which helps maintain osmotic potential.

A response scoring in level 1 on the mark scheme will be limited in scope and not present a clear and coherent structure. An example of an answer scoring in level 1 can be seen below. Here the learner has identified some isolated pieces of information about how substances are transported but there is nothing further that is creditworthy in the response. The confusion concerning guard cells can be ignored.

- Cell membrane ~~controls what come~~
- It uses diffusion, it diffuses to nutrients and oxygen through its thin substance
- 
- It only takes in what it need.
- Semi permeable membrane.
- Short diffusion pathway.
- It has palasade cells - guard cells which allows the substances in and out of the cell.

### Question 4ai

The correct response of "bone marrow" was given by the vast majority of learners

### Question 4aii

Most learners scored both marks on this question with the majority naming red and white blood cells as the two specialised cell types produced.

The response below was awarded two marks – the learner has given lymphocytes as a clarification for white blood cells which is acceptable but not needed!

1. Red blood cells (~~erythrocytes~~)
2. white blood cells (lymphocytes)

Named types of white blood cells were seen relatively frequently. These were accepted responses and both marks could have been awarded for different named types of white blood cells. The response below also scored both marks.

1 Red blood cells  
2 phagocytes.

Incorrect responses tended to name other types of specialised cells. Responses giving one or both of the gametes as answers were seen fairly frequently amongst the incorrect answers.

The response below scored no marks.

1 Sperm cell / egg cell  
2 nerve cell

### Question 4bi

The response “embryonic stem cells” was most commonly seen and awarded a mark for this question. Many correct answers were seen where learners responded in terms of potency – totipotent and omnipotent were both correct answers and seen frequently. Where learners scored no marks for this question it was often a result of the answer being left blank.

### Question 4bii

This question was answered correctly by most learners. An example of a correct response can be seen below. This was awarded one mark.

Mitosis

A common incorrect response can be seen below, this is seen in cases where learners confuse the two different types of cell division. This response is awarded no marks.

meiosis

### Question 4c

This question was answered well across the board with most learners being awarded two out of the three marks. Learners were able to correctly describe the trend shown on the graph and many answers were both thorough and confident. There was a tendency amongst many learners to try to justify their statements about the trends by quoting data from the graph in support of their response. In most cases this merely served to restate the same marking point and did not provide any extra information worthy of credit.

The response below is an example of an answer where the learner has taken figures from the graph but has not provided context for this data in the form of a description in some cases. This response was awarded two out of three marks.

9 patients showed mild improvement after therapy compared to 3 patients who showed no improvement. 5 patients showed moderate improvement and 3 patients showed significant improvement. Overall the therapy does help to improve as 17 patients out of 20 showed improvement.

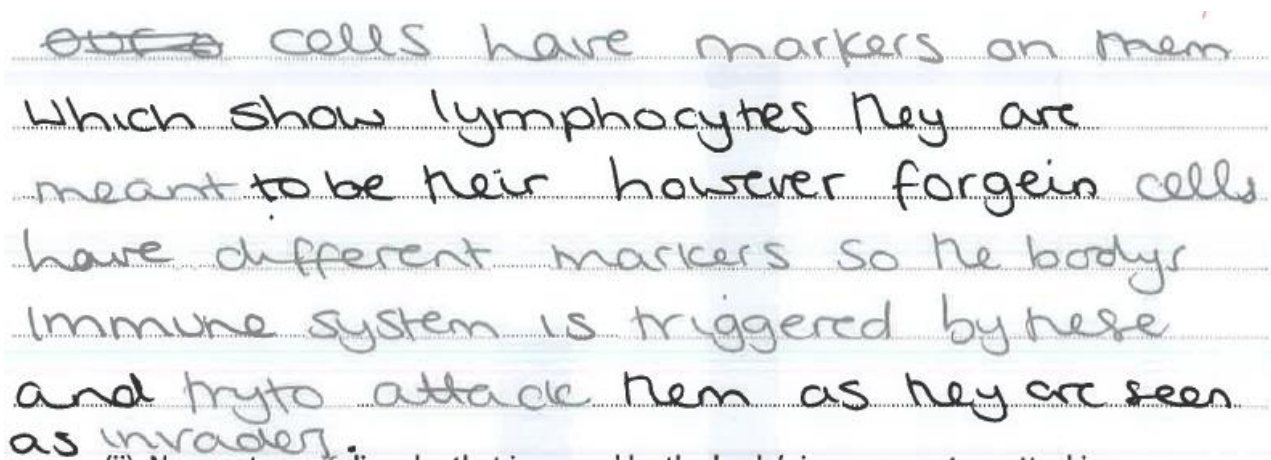
### Question 5ai

This question proved challenging for most learners. Many responses seen were phrased in a very general way and lacked detail. Most learners awarded at least one mark had the idea of the immune system attacking the transplanted organ



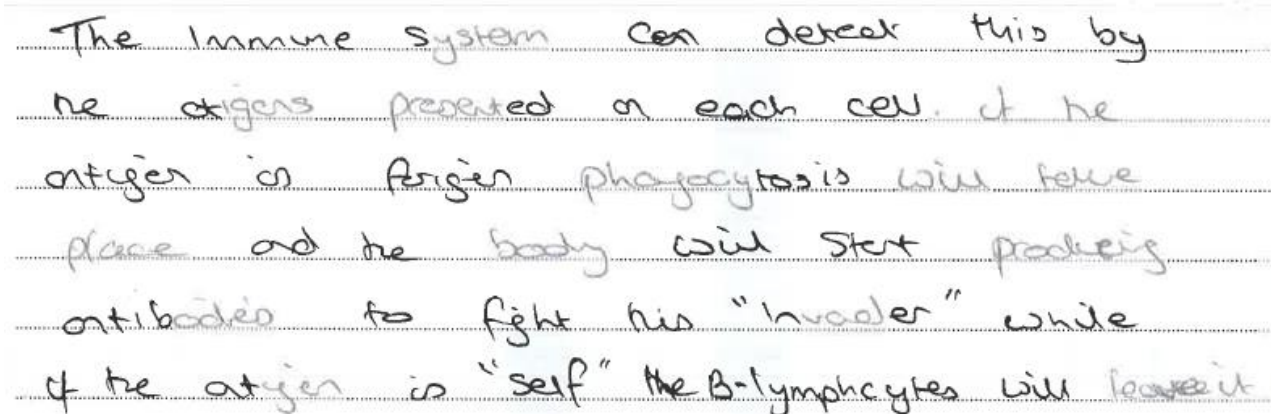
as part of their response but very few answers linked this to the antigens on the cell surface. Some learners attempted to explain this concept but made reference to "tags" on the cell which is not sufficient for a mark at Level 3.

The response below was awarded one mark. There are some good ideas within this response but the language is too vague to credit further marking points. Learners must be comfortable using the correct scientific terminology when discussing immunology as otherwise it is easy for answers to become muddled.



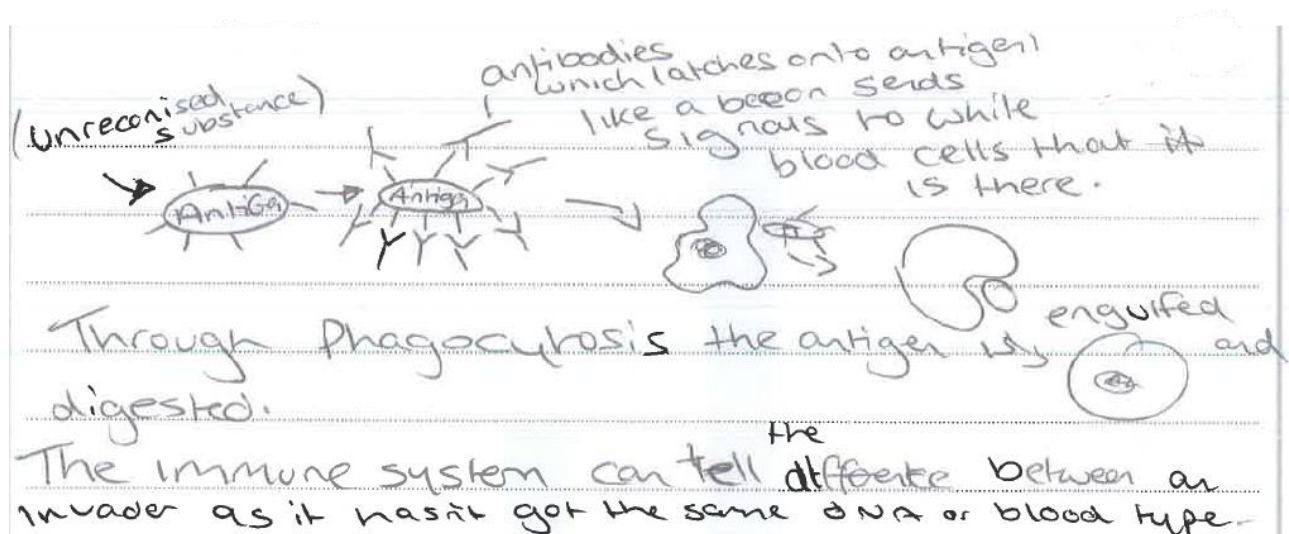
~~our~~ cells have markers on them which show lymphocytes they are meant to be their however foreign cells have different markers so the body's immune system is triggered by these and try to attack them as they are seen as invaders.

The next response was awarded two marks. The learner has correctly identified the role of the cell surface antigens and has cited the role of the immune system in recognising these antigens but has not developed their explanation far enough to be awarded the third marking point.



The immune system can detect this by the antigens presented on each cell. if the antigen is foreign phagocytosis will take place and the body will start producing antibodies to fight this "invader" while if the antigen is "self" the B-lymphocytes will leave it.

Some learners found it easier to use diagrams to explain their answer. An example of a response where the learner used diagrams can be seen below. This was awarded two of the three marking points. There is some confusion in the answer but there is enough to credit two of the marking points as given on the mark scheme. Diagrams will be credited if they contain correct, relevant information.



A relatively common misconception seen here was that the cells of the immune system recognise the DNA of cells they come into contact with, an idea that was repeated in Q5aiii in several answers. This may come from the idea of each individual having a different genetic fingerprint but does signify a fairly fundamental confusion about the nature of cell structure.

### Question 5aii

This question was well answered in a lot of cases with learners either naming the type of disease as “autoimmune” or giving a named type of autoimmune disease. The most commonly named disease found within incorrect responses was HIV or AIDS. This appeared to be a common misconception based around the virus’ infection of immune cells.

### Question 5aiii

This is a question where many learners were disadvantaged by incorrectly interpreting the command word. The majority of learners described the trend in

rejection rates seen in the graph but did not expand on this further. For a question asking learners to explain the trend seen in a set of data there is an expectation that they will identify the trend and then go on to apply their knowledge of biological processes in order to explain why that trend is seen.

The following is an example of a learner response which was awarded one mark. The learner has identified that related donors have a lower rejection rate but has not provided any additional information beyond this. Answers where learners repeat the same marking point several times but with slightly different phrasing are seen very frequently and this is something that learners should be aware that they must avoid.

Donors from people who are not related to the patient have a higher rejection rate (20%) and lower acceptance rate (82%) compared to related donors which have high acceptance rate (95%) and low rejection rate (5%). Related donors are better donors as the body is less likely to reject the transplant

The next response was awarded two marks as the learner has begun to expand on their identification of the trend seen in the graph. They have brought in the idea of antigens present on the donor organ which is awarded the second marking point. To be awarded full marks the learner would need to go on to explain further – for example suggesting why some related donor organs may still be rejected or explaining why non-related donor organs may not experience rejection.

If the donor is not related rejection is so much higher at 18%, while if the donor is related the rejection rate is a lot lower at around 5% as our body immune system does not find this organ as a threat due to having the same antigens.

### Question 5b

This question was attempted by the vast majority of learners and most responses scoring either one or both of the identification marks. Again it was use of incorrect terminology or language that was too vague in the expansions that let learners down in some places.

The response below was awarded two out of four marks. The idea of the immune system not attacking the transplanted organ is accepted here for the first identification point in the mark scheme but the statement that the immune system is suppressed without any further elaboration is not sufficient for a mark. The second section of the answer has the statement that the patient is more susceptible to infection for an identification point but again the learner has not elaborated far enough to be awarded an expansion point for this section of the answer.

**Reason to take immunosuppressants**

After an organ transplant, there is a risk of organ failure due to the immune system attacking the organ. By taking immunosuppressants, the immune system is suppressed and so won't ~~not~~ attack the 'foreign' organ.

**Effects on patient's health**

Due to the immune system being suppressed, it's likely that a patient will be highly susceptible to ~~infections~~ ~~and~~ ~~has~~ illness (e.g. a cold).

Below is an example of an excellent response which scored all four marks. The learner has clearly identified each point and then made a clear link between their identification and the specific role of the immune system cells.

**Reason to take immunosuppressants**

To slow the immune response so that the foreign antigens on transplanted organ won't be detected and attacked. ~~by~~  
~~Antibodies~~ Antibodies won't be produced by plasma cells.

**Effects on patient's health**

Patient more likely to get infections as the immune response ~~is~~ is slowed / stopped by immunosuppressants the T helper cells can't produce cytokines which initiate release of B lymphocytes in order to fight infection and produce antibodies.

(Total for Question 5 = 11 marks)

**Question 6ai**

This question was answered well with most learners giving the correct response of "recessive" as their answer.

An example of a correct response can be seen below.

<input type="checkbox"/>	<b>A</b> diploid
<input type="checkbox"/>	<b>B</b> dominant
<input type="checkbox"/>	<b>C</b> haploid
<input checked="" type="checkbox"/>	<b>D</b> recessive

**Question 6aii**

Again, this question was answered well with most learners giving the correct response. An example of this can be seen below. Even though the learner has made a slight spelling error it is absolutely clear that they are giving the correct response and so the mark is awarded.



heterozygous

A commonly seen response was “carrier”, which could be awarded the mark according to the additional guidance in the mark scheme. The response below was awarded one mark.



carrier

### Question 6b

There were a range of answers to this question showing the full spectrum of understanding of the genetics topics in the specification. In some cases learners disadvantaged themselves by providing a one-sided evaluation – this was seen in several answers which stated that the diagram did not provide enough information and so could not be used at all. In many cases it was evident that these learners were not familiar with genetic pedigree diagrams showing phenotype only. Statements that the diagram would be easier to interpret if carriers were shown were given credit for this statement as evidence of evaluation but there were cases where learners then did not develop their answer further which limited marks in some cases.

The response below is an example of a learner awarded marks in level 1 of the mark scheme. They have correctly identified the disorder as recessive but show some confusion in their answer as to what this means and then later refer to the gene as a recessive male gene which reduces the clarity of their answer. There are some correct statements here but there is only limited evidence of understanding with no consistent line of reasoning and so the answer is awarded a level 1.

In figure 6 it shows 3 chains of different generations. Each generation has an affected male, except from the very first male and female, this is helpful because it shows that the anaemia isn't inherited from the very start.

There is a higher chance for the unknown male to be affected than the female to be affected, this is because it is a recessive male gene.

Figure 6 is fairly useful to determine the unknown male to be affected, or not.

Below is an example of an answer that was awarded marks within level 2. The learner has shown an appreciation of the limitations of the diagram and has extracted some information from it in order to provide evidence for their evaluation. The detail given in places is relatively limited and lacks the further development needed for answers awarded in the next level of the mark scheme.



The diagram shows unaffected parents, possibly carriers, having three children. One of three is affected and the other two are likely also carriers. Both unaffected children have children who are either affected or are carriers. This means that the likelihood of the unknown mate is high because its father is affected meaning the unknown male has the gene and his mother may not be affected but may also be a carrier. The diagram shows this by showing the entire family tree rather than the focused person's line. This chart is useful as it shows the likelihood in instances of other family members.

The strongest answers, awarded marks in Level 3 of the mark scheme, showed a thorough understanding of how genetic diagrams could be used to study patterns of inheritance. These answers gave a balanced evaluation of the diagram. Many learners made suggestions on what additional information could be analysed to improve any prediction made.

Many responses, as shown in the example below, used their knowledge of inheritance to work out probabilities of inheritance for the unknown male based on the possible genotypes of the mother. This was not required for learners to be awarded top marks for this answer but in cases where it was seen this demonstrated an in depth understanding of the topic.

The response below is an example of a very strong answer awarded marks in Level 3.

I believe that this pedigree diagram would be useful in predicting whether the unknown male has sickle cell anaemia. This pedigree diagram shows that sickle cell anaemia is a recessive disorder. This is shown because the disorder does not affect people for several generations, then a male was affected. This means that the affected male's parents and grandparents were carriers of the recessive allele.

one of (the father)  
 The parents of the unknown male has sickle cell anaemia while the mother is not affected.

Although, the mother could potentially be a carrier. If the mother was a

	A	a	
a	Aa	aa	would have a 50% chance of inheriting the condition and would have a 50% chance of being a carrier.
a	Aa	aa	

Although, if the mother wasn't a carrier,

	A	A	
a	Aa	Aa	the unknown male would have a 0% chance of inheriting the condition but would have a 100% chance of being a carrier.
a	Aa	Aa	

(Total for Question 6 = 11 marks)

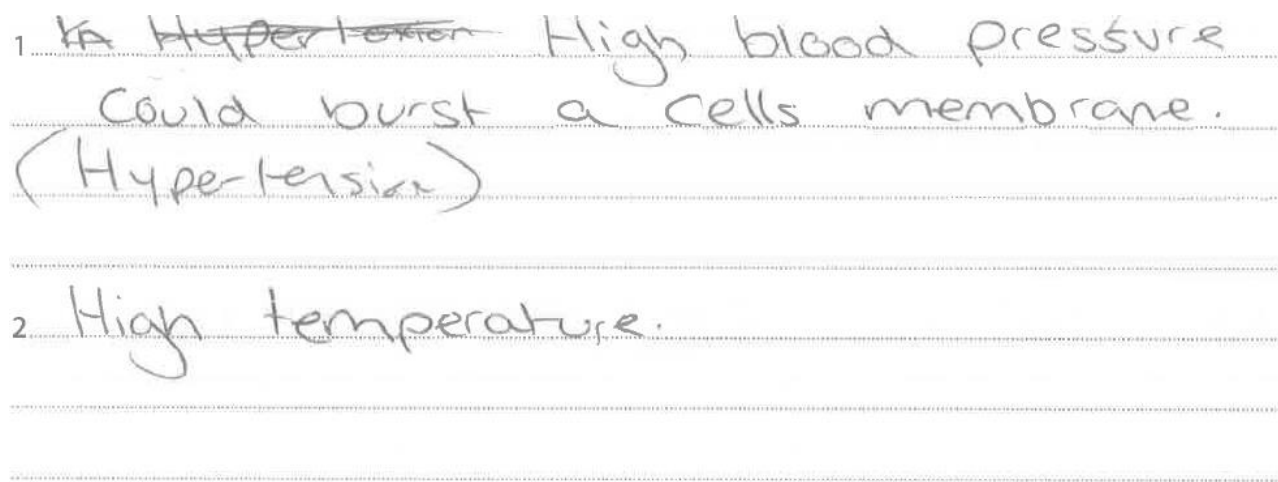
**Question 7ai**

This question was answered well with most learners correctly identifying the disease as cystic fibrosis.

### Question 7a ii

This question proved very challenging for the majority of learners with many candidates either not attempting the question or only scoring one mark. In many cases there was confusion between injury to cells and injury to body tissues and several incorrect answers gave responses linked to tissue injury.

The response below was given one mark for identification of high temperatures causing cellular injury but was not credited any further marks.



The following response was awarded two marks. Both identification points are correct but the expansions are too vague to be awarded credit – there is no direct connection between the cause of the injury and why this leads to membrane damage.

1 abnormal temperatures. -denatured enzymes & so the cell membrane might not know which cells to let through

2 Hypoxia, ~~is~~ is a lack of oxygen which could lead to the death of cells including the cell membrane.

The response below is a rare example seen that was awarded all four marks

1 ~~cell swelling~~ hyper/hypotermia can seriously injure cells as many key enzymes can denature the cell membranes will also move apart  
2 when too hot and closer together when it's too cold and the cholesterol ~~between~~ tries to keep the cell membrane from falling apart.  
peroxisomes, when they try and kill the cell by dissolving them must burn through the cell membrane with hydrogen peroxide to attack the usually infected cell.

### Question 7a iii

Most learners identified the role of the sodium potassium pump in controlling the balance of ions between the inside and outside of the cell. After this point many learners did not manage to make the link between ion concentration and

the resulting cell swelling. In some cases learners gave an answer relating to resting/action potential of the cell. It is vital that learners apply their knowledge to the context given in the question as generic answers or answers which apply to a different biological context will not be able to access all the marking points.

The response below was awarded one mark as the reference to the build up of ions was enough to be credited the identification point for maintaining the balance of ions, however the learner does not then correctly expand on this further. Answers similar to this one were seen very frequently.

When the sodium-potassium pumps aren't functioning correctly, the ions can't move as they should causing them to become trapped and build inside the cell. The build up of ions inside the cell causes it to swell because it is not built to function in this way.

Many learners could link the imbalance in ions to increase in movement of water inside the cell. But often the link between the increased concentration of ions within the cell and osmosis was left out. This learner was awarded 3 marks for their answer.

When the pump stops functioning normally, more sodium will be pumped into the cell, this means that more water will be drawn into the cell in order to bind to the sodium, as a result of more water being drawn into the cell, the cell swells and grows in size.

The response below is an example of an answer which received all four marks. There is some confusion about diffusion of ions in the middle of the answer but as this does not directly contradict any of the learner's other points this is ignored.

Sodium-potassium pumps pump sodium out of the cell, but if it stops that means sodium will build up in the cell <sup>by leaking through diffusion</sup> and potassium will leak out through diffusion. If too much sodium is inside the cell, the water potential will be lowered as there is more sodium than water, so osmosis will occur and water diffuses in, causing the cell to swell with too much water.

### Question 7bi

In this question learners sometimes struggled with finding the correct terminology to describe the term in the question. Reference to rapid cell division was seen frequently in incorrect answers. An example of this can be seen below.

cell producing uncontrollably quicker than normal.

In these cases it is likely that learners were responding to the reference to tumour formation in the question.

Many responses were very descriptive and in some cases it appeared that learners over complicated their answers. An example of an answer awarded the mark can be seen below. The statement is very simple but sufficient for a one mark definition question.

When a cell changes its type.  
A change in cell type.

## Question 7bii

Here most learners gave responses that cited uncontrolled cell division and many could identify that the damage in DNA could lead to a mutation. Missing from almost all answers was the link between a mutation in the DNA and the resulting change in cell division. The role of oncogenes and/or tumour suppressor genes was seen in very few answers which is disappointing.

A response awarded one mark can be seen below. This answer contains a relatively common misconception that the reason for rapid cell division is in order to repair the DNA damage.

If the DNA is damaged then it can affect the process of mitosis as the cell tries to repair the damage it divides many many times (metoplasia) and can cause a tumour. Also the damaged DNA could form mutated cells which may also cause a tumour.

The response below was awarded all three marking points. Here the learner has made a clear link explaining why DNA damage leads to the increased division of the cell.

Damage to DNA can cause the wrong amino acids to code for the wrong proteins. This means that faulty proteins are synthesised. Also, the genes in DNA, proto-oncogenes, that stimulate cell division are permanently activating receptors of cells and are constantly releasing growth agents that cause the uncontrollable cell division. **(Total for Question 7 = 13 marks)**

### Question 8a

This question proved difficult for many learners, with all three incorrect answers seen.

An example of a response showing the correct answer can be seen below. This was awarded one mark.

<input type="checkbox"/>	<b>A</b> aorta
<input checked="" type="checkbox"/>	<b>B</b> coronary artery
<input type="checkbox"/>	<b>C</b> pulmonary artery
<input type="checkbox"/>	<b>D</b> vena cava

### Question 8bi

Many learners gave responses here that indicated a lack of understanding about what genetic screening involves. Answers mentioning DNA or genes were seen less frequently than expected and many learners gave responses referring to testing that provided information about the structure of the heart.

The response below scored no marks. Many learners made reference to “checking family history” but this is not sufficient for a description of genetic screening.



Genetic screening will check for any blood clots in the major arteries using family history and scientific testing. If there are signs of blood clots then the patient is at risk of developing or may already have CHD.

The learner below was awarded two marks. They have correctly identified that the screening would look for genes associated with CHD (the naming of a specific gene was not required here) and have suggested how a DNA sample could be taken. There is confusion about how this sample is analysed with reference to viewing it through a microscope and so this cannot be awarded the third marking point. Learners would not be expected to explain how the DNA sequence is obtained but they should know that the sequence of bases is determined in the process of screening tests.

The genetic inheritance of <sup>the</sup> Alpha-1 antitrypsin<sup>gene</sup> can be identified on genetic screening tests. This gene increases the risk of getting CHD. The screening would show if the gene is present and who it was inherited from in the family. The DNA sample would be taken from a blood test and the DNA would be viewed microscopically to see if this gene is present.

### Question 8bii

This question had a range of good quality responses, generally learners performed very well. The discuss command word allowed learners to demonstrate the breadth of their knowledge and apply it to the context from the question.

Where learners were awarded marks in level 1 discussions were brief or limited in scope, commonly seen were responses choosing to discuss only one or two of the suggested lifestyle changes. Many learners addressed only one element of the question discussing either reduction of symptoms or the prevention of CHD but not both

Below is an answer of a response that scored in level 1. The learner has made some good points but these are superficial and lack a developed line of reasoning.

reducing saturated fat in the diet would help prevent CHD developing as it would reduce cholesterol in the blood. It would reduce symptoms by stopping cholesterol levels getting any higher.

regular exercise would prevent CHD developing by reducing the chances of becoming obese / would help the patient lose weight.

giving up smoking would increase the amount of oxygen getting into the blood, meaning the heart doesn't have to work as hard to get enough oxygen ~~in the~~ around the body.

reducing blood pressure would mean that the heart wouldn't have to work as hard and would stop cholesterol blockages causing the blood vessels to become wider.

The response below is from a learner awarded marks in level 2. There is a greater depth seen in their response and they cover a wider range of topics within the answer given. There are some elements of confusion within their answer and some areas which should be further developed in terms of application of their knowledge of biological processes. These elements prevent the learner from scoring in level 3.

To prevent coronary heart disease there are many things doctors suggest firstly reducing fat in the diet. This helps with most health problems as it reduces the stress on the blood vessels and ~~it~~ is less likely to start plaques if you are fit. Doing regular exercise is healthy as it helps break down fats and sugars in your diet which could build up to be cholesterol which is very unhealthy for your heart as it causes blockages in blood vessels. Smoking makes your blood thicker and stickier which increases the risk of a blood clot or a blockage that leads to CHD. Smoking is also

bad for your lungs which provide necessary oxygen for your heart to pump around the body. Reducing blood pressure is a major way of preventing CHD. as when your blood pressure is too high tears can appear in your blood vessels which are fixed with platelets but things can get stuck on top of them which narrows the blood vessel and could possibly block one or more of the coronary arteries this means you would either need a stent put in to widen the artery or even a single, double or even triple heart bypass to divert the blood around the blocked arteries. Taking blood thinning medication could help people who are at particular risk of getting CHD by reducing blood pressure as less pressure has to go into pushing 'thinner' blood.

Below is an example of a response which scored in level 3. The learner has given a clear discussion supported with consistent lines of reasoning and bringing in knowledge of the biological processes involved from the relevant sections of the specification. This is an excellent answer!

Firstly the patient should reduce the saturated fat in their diet because this reduces their risk of developing atheromas - a build up of plaque in the arteries which reduces blood flow and increases blood pressure

- CHD is caused by blockages in blood vessels, mainly arteries, so if the patient already has CHD, intaking less saturated fats would ~~not~~ help the atheromas break down over time and it would not add anymore plaque to existing ones

- Secondly, the patient should do regular exercise. This is because more exercise causes the persons breathing rate to increase <sup>from the normal 12-20 breaths per minute</sup> which provides the blood with more oxygen from gaseous exchange

- The more oxygen the cardiac cells get, the more aerobic respiration that can take place. This results in the cardiac cells having energy to

contract and pump blood around the body and it stops the heart muscle 'dying'.

: Also, exercise ~~re~~ decreases blood pressure as the arteries are constantly being required to be active which decreases the risk of the collagen outer layer hardening and the elastic layer losing its elasticity.

• The patient should also not smoke. Nicotine stimulates the production and release of adrenaline which increases blood pressure. High blood pressure, or hypertension <sup>(140/90 mmHg or above)</sup>, puts a strain on blood vessels and makes them more susceptible to damage. Blood pressure is also increased by smoking as the Carbon dioxide binds with haemoglobin to form carboxyhaemoglobin which increases blood volume inside the vessels.

• Reducing blood pressure can also prevent the risk of CHD and can reduce the symptoms. Hypertension can be caused by smoking, alcohol, stress or ~~organ~~ inadequate organ function e.g kidneys.

To reduce their blood pressure, the person could reduce their salt / sodium intake as this increases water potential in the blood leading to hypertension or they could take anti-hypertensives (-tablets) to reduce the strain on the arteries by widening them taking the blood pressure back to the healthy ~~range~~ number of <sup>110/80</sup> mmHg.

(Total for Question 8 = 13 marks)

## Summary

Based on their performance in this paper learners should:

- Take care to write their responses in a way that correctly addresses the command word in the question. Paying particular attention to where they are asked to explain data they are given as this will require them to link the trends seen to their understanding of the biological processes.
- Ensure they are comfortable using the correct scientific terminology to discuss topics covered in the specification. This is particularly important in immunology where there are many key terms that could be confused for one another.
- Make sure that each point given in a response brings in new information and does not simply restate a point that they have already made.
- Ensure the process and purpose of each diagnostic test within the specification is understood – learners do not need to describe test methods in detail but they should know the basic procedure and how the results are presented.
- Be careful to use clear and simple language within their responses and avoid overly descriptive but vague terminology such as “powerhouse of the cell” for mitochondria
- Apply the correct context when writing their responses – generic descriptions of biological processes will not gain full credit if a specific context is given.
- Be aware that the same process may be used in more than one context (for example the sodium-potassium pump has a role in transmission of the action potential and in cell swelling) and make sure that they know the differences between them.

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