



# Examiners' Report June 2019

## IAL Biology WBI04 01

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## Introduction

Candidates tackled this paper really well. Excellent responses were seen, with evidence that centres had thoroughly prepared their candidates for this exam with questions from past papers. There were relatively few blank responses even towards the end of the paper, suggesting that the paper was not too long for the time available. All of the mark points were seen. The multiple choice questions worked well and were discriminating, as were the calculations and written responses.

## Question 1 (c)

Candidates clearly know that the Golgi play a role in the modification of protein and its packaging into vesicles for exocytosis. Only the stronger candidates, however, answered the question and linked their role into fungal decomposition. A few candidates forgot that bacteria are prokaryotic organisms and talked about the role of Golgi in bacterial decomposition.

(c) Explain the role of the Golgi apparatus in the decomposition of organic matter.

(3)

\* Golgi apparatus modifies proteins from the rER into enzymes.

\* It also packages extracellular enzymes such as protease into small vesicles.

\* These vesicles fuse with cell membrane <sup>on</sup> & are released outside ~~of~~ to organic matter, which they breakdown into smaller molecules.

\* proteins broken down to amino acids.



This response illustrates the first, third and fourth mark points. The second mark point was rarely seen.



Do not write everything that you know about a topic; read the question carefully and write your answer within the context of the question.

## Question 1 (d)

This question did not cause too many problems for candidates, except those who referred to energy production instead of ATP production.

(d) Explain the role of these mitochondria in the recycling of carbon.

(2)

Mitochondria is the site of aerobic respiration this is where glucose is broken used for aerobic respiration releasing carbon dioxide as a waste product and releases energy.



This response was awarded both mark points. Examiners are aware that glucose is not used in the mitochondria but this is unit 5 content.



Whenever referring to energy, always state what form the energy is in; for example, ATP or light energy

## Question 2 (a)

Some very good responses were seen to this question; candidates have good knowledge of histamines and their role, even though this borders on the edge of what is expected by the specification. Marks were not achieved by candidates who thought that vasodilation occurred in veins and capillaries, or that the arteries and veins became more permeable.

### 2 Sepsis is caused when bacteria get into the bloodstream.

As a result, an inflammatory response occurs that can destroy body organs and result in death.

(a) Explain how inflammation is a response of the body to infection.

(2)

The white blood cells release histamines that cause arterioles to dilate and the capillaries to become more permeable, so more blood flows in the arterioles and this causes white blood cells, plasma and antibodies to leak out of the capillaries and fight the pathogen.



This response illustrates all three mark points.



Make sure you are clear about the structure, properties, and functions of capillaries, arteries, and veins.

## Question 2 (b) (i)

The question asked for the meaning of the term antibiotic on several occasions and this was evident from the responses seen. A few candidates confused antibiotic with antibody.

## Question 2 (b) (ii)

This question caused few problems for candidates except for those who used the expression 'immune' instead of 'resistant'.

- (ii) Explain why scientists need to develop alternative treatments for bacterial infections. (2)

This is because bacteria can become resistant to the antibiotic due to gene mutation hence new antibiotics need to be produced to kill the resistant bacteria. There is an evolutionary race.



All three mark points are illustrated here.

Bacteria mutate rapidly changing their structure and developing antibiotic resistant properties which make antibiotics ineffective in treatment.

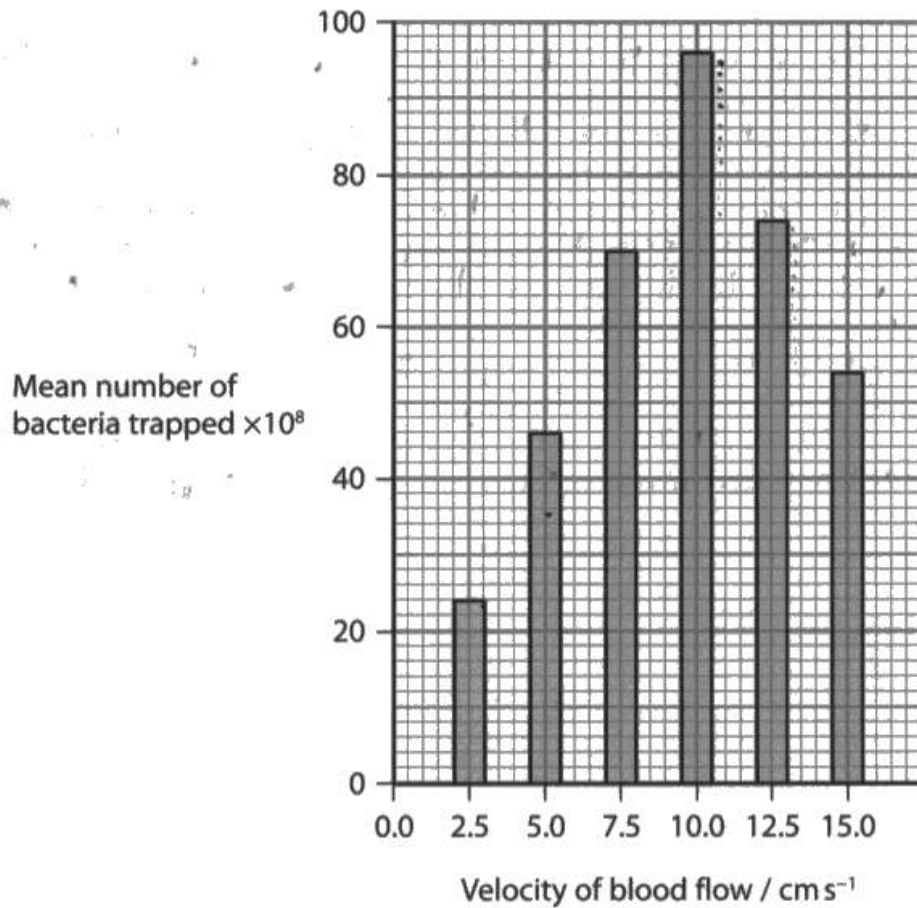


Another way of expressing the three mark points.

### Question 2 (c) (i)

The answers seen prove that candidates have learnt to include pivotal points in their descriptions of data.

The graph below shows the mean number of bacteria trapped as blood is passed through the filter of nanowires, at different velocities.





(i) Describe the relationship shown in the graph.

(2)

As the velocity of blood flow increase mean number of bacteria trapped shows a relative increase. Highest <sup>mean</sup> number of bacteria <sup>trapped</sup> are at  $10.0 \text{ cm}^{-1}$  and the <sup>mean</sup> number is  $96 \times 10^8$ . The lowest mean number of bacteria trapped is <sup>mean</sup> at  $2.5 \text{ cm}^{-1}$ , the number is  $24 \times 10^8$ . The difference between the highest and the lowest mean numbers <sup>is</sup>  $72 \times 10^8$ . After  $10.0 \text{ cm}^{-1}$  it shows a <sup>drop</sup> decrease in the mean number of bacteria trapped. The drop of mean number of bacteria trapped at  $12.5$  and  $15.0$  are similar.  $\downarrow$   
The dif. drop from  $10.0 \text{ cm}^{-1}$  to  $12.5 \text{ cm}^{-1}$  is ~~11~~  $11 \times 10^8$  and from  $12.5 \text{ cm}^{-1}$  to  $15.0 \text{ cm}^{-1}$  is  $10 \times 10^8$ .



Both mark points are expressed in this answer.



Use the mark allocation to help you estimate how much to write. Although you will not lose marks for writing too much, you may run out of time to complete the paper.

## Question 2 (c) (ii)

Candidates coped well with this unfamiliar context. Both mark points were seen but few candidates actually included them both in their answer.

(ii) Suggest why the velocity of blood flow through the filter affects the mean number of bacteria trapped.

(2)

As the speed increases till 10.0cms<sup>-1</sup> means more blood passes through the filter at any given time so more bacteria can be trapped. After 10.0cms<sup>-1</sup> the speed is too great that the bacteria have enough force to push through the barrier so some won't be trapped.



This candidate did explain both aspects of the data.



Look at the data and mark allocation to help you structure your response. If the graph is showing two different pieces of data and there are two marks allocated for the question, you will be awarded one mark for an explanation of each data trend.

### Question 3 (a)

Candidates clearly know how to culture bacteria, including the specific time and temperature required for incubation, and the importance of avoiding anaerobic conditions. It was also evident that centres have been using the principal examiner reports from previous series; far fewer accounts implied that the bacteria were spread onto the petri dishes directly.

3 Cultures of bacteria and viruses can both be grown in a laboratory.

(a) Describe **one** way in which bacteria can be grown in a laboratory.

(3)

An agar medium containing glucose must be prepared.  
Inoculate a strain of bacteria by using a cotton swab to ~~swab~~ dippe in a sample and swiped throo across the agar. cover the petri dish and use tape to secure the lid. Ensure to leave gaps in tape to allow  $O_2$  to pass in ~~to~~ so that aerobic respiration takes place and ~~for other~~ anaerobic strains of bacteria do not grow. Incubate this the petri dish at  $30^{\circ}C$  for 24 hours. After which a culture of bacteria will be pre produced -



This response illustrates all four mark points.

### Question 3 (b) (i)

Very few candidates failed to score both marks for this question. Some candidates did not make it clear that viruses could contain either RNA or DNA and a few others suggested that all viruses had envelopes.

(i) Name **two** structures found in all viruses.

(2)

– Genetic Material (DNA or RNA)

– Protein Coat (Capsid)



An exemplar answer, gaining full marks.

### Question 3 (b) (ii)

Mark points one and two were frequently awarded. Fewer candidates described why the virus particles were dependent on the host cell.

(ii) Explain why viruses have to be cultured in living cells.

(2)

- viruses need a host cell to replicate  
as it needs DNA polymerase, amino acids.



This candidate scored the third point, as well as the second, and illustrated how succinct an answer can be to score well.



Keep your sentences short. Include just one or two pieces of information to save time.

### Question 3 (b) (iv)

Many candidates demonstrated an understanding of the question but struggled with the clarity of their responses.

(iv) Suggest why different types of virus have to be injected into different parts of the chicken embryo.

(2)

Each virus is specific to one type of cells as the viral attachment ~~moieties~~ molecules have a shape that is complementary to a receptor on the cell membrane of a specific type of cells. Therefore it can bind to the receptor and inject its core into the cell and integrate its genetic material and replicate. ex ~~HIV~~ ~~is only~~ ~~cap~~ ~~of~~ ~~12a~~ on HIV is complementary to only the CD4 receptors on T<sub>H</sub> cells.



This candidate scored full marks for this response.

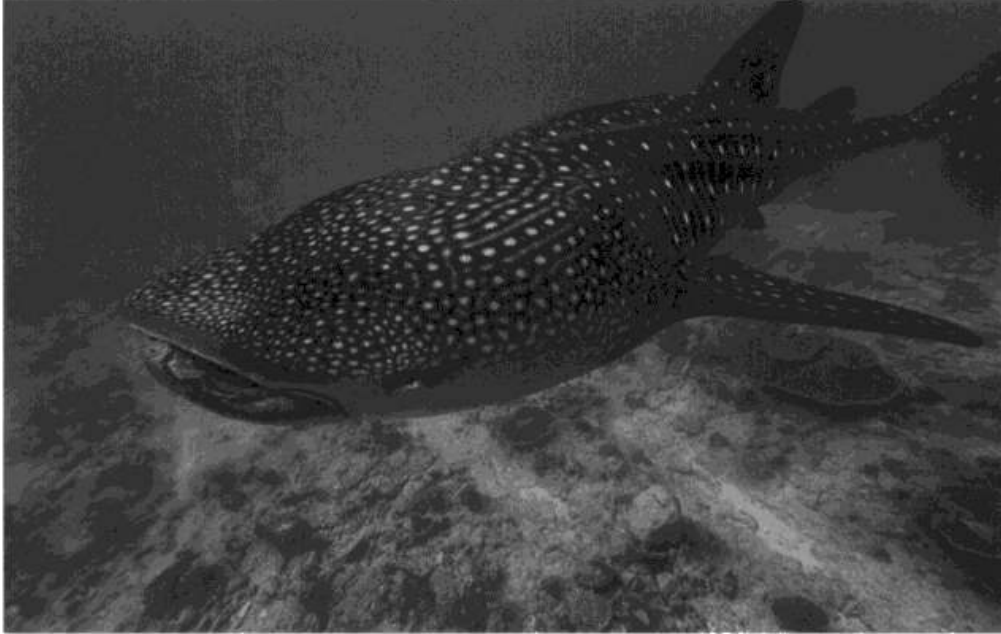


The command word 'suggest' means that, although you may not have been taught the answer, you are expected to apply your knowledge of the specification to formulate a reasoned response.

## Question 4 (a)

Candidates covered a variety of the responses given in the mark scheme, however, many only provided one reason and did not achieve the second mark.

4 The photograph below shows a whale shark.



© crisod/Getty Images

Magnification  $\times 0.01$

Whale sharks are an endangered species.

The number of individuals of this species and their distribution are not known.

(a) Give **two** reasons why this species is difficult to study.

(2)

The species is difficult to catch and observe because they are deep down in the sea.

~~There are only limited number of whale sharks because the~~

The number of whale sharks are less as they are endangered so difficult to find them.



This response illustrates the first and third mark points

Whale sharks are aquatic organisms that live in the sea so they move around a lot, therefore it is difficult to study them.

As they are endangered, only a few whale sharks are available, therefore it is hard to find them.



This response illustrates the first and fifth mark point.

These species live in <sup>the</sup> deep sea and are camouflaged to ~~the~~ its ~~surround~~ surrounding  $\therefore$  they are difficult to see.

Sharks have no geographical barrier so they can easily migrate to other areas.

So they same whale can be counted <sup>twice</sup> in 2 different locations



This response illustrates mark points three, two and five.



### Question 4 (b) (i)

Many responses were seen relating to the source of DNA in the water, many of which were covered by the mark scheme.

(b) Environmental DNA (eDNA) is present in seawater at very low concentrations. This DNA is used to study whale sharks.

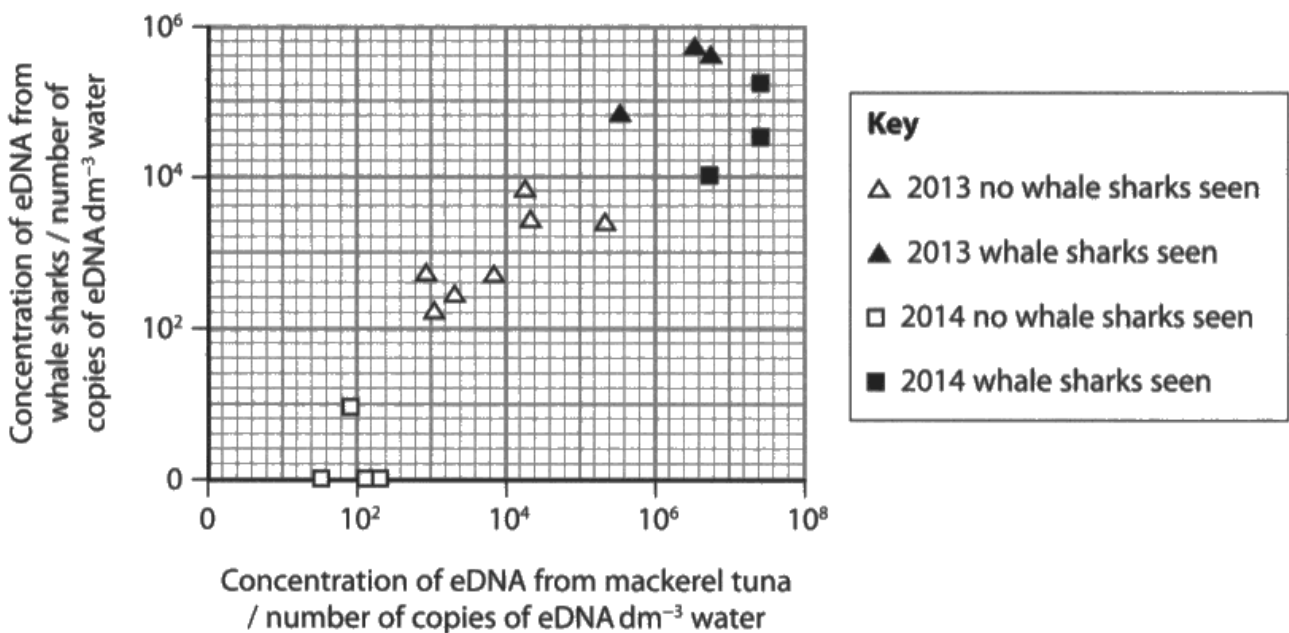
In one study in 2013, scientists determined the concentration of eDNA from whale sharks in the Arabian Gulf.

They also determined the concentration of eDNA from mackerel tuna, a species of fish, in the same area.

The scientists also recorded when they saw the whale shark.

The scientists repeated this study in 2014.

The graph below shows the results of both studies.



(i) Suggest **one** source of eDNA from whale sharks in the water.

(1)

From blood samples or cells of the skin that may have broken off.



Blood and skin cells were common answers.

(i) Suggest **one** source of eDNA from whale sharks in the water.

(1)

*faeces.*

---



Faeces, although sometimes incorrectly spelt, was another common source of DNA stated.

## Question 4 (b) (ii)

All mark points were seen but only the stronger responses included all three conclusions.

(ii) Using the information in the graph, describe conclusions that can be drawn from this study. (3)

There seems to be a positive correlation between concentration of eDNA from whale sharks and mackerel tuna, since the higher the concentration of eDNA ~~of~~ from mackerel tuna, the higher that from whale sharks. This is probably because at areas where there is more tuna on which the sharks can feed, the sharks are more abundant as they need to eat. No whale shark eDNA is present at around  $10^2$  copies of eDNA  $\text{dm}^{-3}$  water of tuna eDNA, as the tuna population is probably too low to support a pop provide enough food for the sharks. The sharks are only seen at very high concentrations of eDNA for both species, probably during the time they are hunting/prying on the fish.



This candidate's response was awarded full marks.



As there were three marks allocated to this question, this is a good hint that you should write three conclusions.

If there is information in the graph which you haven't used in your answer, you are probably not going to achieve full marks; the question will only provide information that you need to use.

## Question 4 (b) (iii)

There were some excellent accounts which worked hard to answer the question. The less able candidates who missed the point of the question still gained two marks for recognising that PCR and gel electrophoresis were both needed.

\*(iii) Describe how the data shown in the graph could have been collected and analysed.

Systematic sampling could have been used. A section of seawater<sup>(6)</sup> was used. At equal intervals, for example every 3 metres, a sample of seawater ~~by~~ or seaweed was extracted. Polymerase chain reaction was used to increase the number of copies of DNA (amplify the eDNA). Then gel ~~electrophoresis~~ electrophoresis was carried out using a restriction enzyme to cut the eDNA in an agarose gel. An electric current ~~is~~ was applied. The position, pattern, height and size of bands was ~~also~~ analysed and compared to existing samples of tuna and shark eDNA. So the concentration of shark and tuna eDNA could be determined at each sampling point. This should have been done on the same day to avoid change in abiotic factors like temperature and light intensity. Then, every year at each sampling point of different eDNA concentrations, a tally chart is ~~used to record~~ used to record whether white sharks were spotted or not. This was repeated at several sections of sea for reliability. So, a mean could be determined.



This was a reasonable account which scored highly, despite being slightly confused in places.

First collect a <sup>sample</sup> known volume of sea water and measure its volume. Add buffer solution to the sample and cold ethanol to precipitate out the DNA. Amplify the DNA using PCR with DNA polymerase, primers, free nucleotides and a cycle of temperatures. <sup>Use restriction enzymes to create fragments and</sup> Then load the DNA into ~~an~~ agarose wells and apply a current (gel electrophoresis) and stain the DNA. Compare profile created with known profile of whale shark and of mackerel tuna. The darkness of the bands could be calibrated as concentration <sup>or amount of</sup> DNA. Collect many samples to get a mean and ~~photograph~~ divide by the volume and multiply by 1,000 to get a concentration per  $\text{dm}^3$ . Plot a graph of concentration of mackerel DNA against whale shark DNA. Take samples from different depths.

(Total for Question 4 = 12 marks)



This is an example of one of the better responses where the candidate has tried to answer the question within the context.

## Question 5 (a) (v)

Other than the responses which stated there would be no energy left for a fifth level, or that the energy was in the form of NPP, candidates scored well.

(v) Suggest why there are only four trophic levels in this food chain.

(2)

there is not enough energy to sustain another trophic level.

only 6 kJ of energy available in trophic level 4, which is not enough for another trophic level.

energy is lost between trophic level, so almost all the energy from trophic level 4 will be lost.



A good example of a well formed answer.



NPP can only be used in the context of plant biomass.

## Question 5 (b) (i)

Candidates had relatively few problems with this question. They had clearly learnt the structure of both starch and cellulose and had been taught that their similarities and differences should be given as pairs within one sentence and not included in two separate descriptions. There was some confusion between alpha and beta glucoses and 1-4 and 1-6 bonds, which was expected.

(b) Plants use energy for the synthesis of starch and cellulose.

(i) Give **two** similarities and **two** differences between the structure of starch and the structure of a cellulose molecule.

(4)

- Both have 1,4 glycosidic bonds

- Both are made of glucose molecules.

- Starch has 1,6 glycosidic bonds while cellulose does not.

- Starch is made up of alpha glucose while cellulose is made up of beta glucose.



A perfectly explained response.



Long sentences in paragraphs are not required. Short, succinct sentences will be clearer and help assess whether you have written a sufficient amount of detail to be awarded.

## Question 5 (b) (ii)

Few candidates scored full marks for this question, even though all the mark points were seen. Mark points one and two, three and four, or one and three were the most frequent combinations awarded. There was quite a lot of confusion between the cellulose molecule and a microfibril; candidates were not clear about the structural relationship between the two.

(ii) Explain why seeds contain starch and cell walls contain cellulose.

(3)

Seeds contain starch because it's the storage food of the seed. Starch contains a lot of glucose monomers, so when hydrolysed it releases a lot of energy. The  $\alpha$ 1,6 glycosidic bond in starch is rapidly hydrolysed by enzymes so faster supply of energy. Starch is insoluble so doesn't affect osmotic pressure. Cell wall contains cellulose because these make up ~~the~~ microfibrils that are parallel to each other in the 1st & 2nd cell walls so they allow cell wall to be strong & flexible.



This candidate was one of the few who scored full marks.



Avoid the use of 'food' as, in this context, food is something that is eaten.



## Question 6 (a) (i)

This question proved problematic for many candidates, despite being based on the unit one specification. Some failed to achieve mark point one because they did not state the simple facts; others believed the mother to be heterozygous and wrote lengthy descriptions about the subsequent possibilities. This did not gain either marking point.

(a) The rhesus antigen is coded for by the dominant allele of the RHD gene.

(i) Explain how a Rh negative mother can have a Rh positive baby, in **Step 1**.

(2)

- The mother is Rh negative so she must have 2 recessive alleles.
- The father could have 1 dominant allele or 2 alleles of RHD gene so he is Rh positive.
- ~~State~~ the presence of ~~rhesus~~ an 1 dominant allele allows offspring to be Rh positive. The baby inherits 1 dominant allele from father and 1 from mother.



This was a well-reasoned response which gained both points.



Read the question carefully and do not assume that it will be identical to one that you have seen on a past paper.

## Question 6 (a) (ii)

Less able candidates only wrote about one possibility, whereas the more able candidates provided both percentages.

(ii) Explain the probabilities of this mother having another Rh positive baby. (2)

Probability is either 50% or 100%. If the father <sup>has</sup> heterozygous allele, the chances of Rh positive baby is 50%, while if the father is homozygous dominant, the chances of Rh positive baby is 100%.



This question posed no problem for this candidate.



Check the mark allocation for the question; if there are two marks, you need to provide two points.

## Question 6 (b) (ii)

Candidates have clearly used past mark schemes to prepare for any immunology questions. Some excellent responses were seen. Common errors included: not answering the question in the context of the rhesus antigen; writing about the rhesus antigen as though it were a pathogen; confusing T helper cells with T killer cells; confusing antibodies with antibiotics; and stating that B cells produce antibody, although this was seen less than in previous series.

Note that macrophages are not present in blood. As this is on the boundary of what is expected by the specification, references to this were not penalised.

**\*(ii) Explain why the mother will produce antibodies to the rhesus antigen, in Step 2.**

(6)

Humoral response will occur. A macrophage will bind to the antigen and enclose it in a vesicle. Lysosome will release enzymes digesting it and the antigen will then bind to MHC protein to form antigen-MHC protein that will move to outer surface of macrophage making the macrophage an APC. T-helper cells will bind to the complex on APC and be activated to release cytokines. Cytokines will activate B cells causing them to undergo mitosis to form a clone of B cells. These B cells will differentiate into plasma cells which will produce antibodies for rhesus antigen. They will also form B memory cells which remain in blood.



This is a clear response which scored virtually full marks.

rheus antigen in the mother blood will  
trigger an immune response.

the rheus antigen will be engulfed by a macrophage  
macrophage, digested with enzymes <sup>from</sup> lysosomes  
~~and its~~ and combined with MHC and present  
on the surface acting as APC cell.

$T_{\text{Helper}}$  will bind to MHC in APC,  
stimulate formation of more  $T_{\text{Helper}}$  cells.  
antigen engulfed by the B cell will also  
combine it with the MHC and present it as APC.  
activated  $T_{\text{Helper}}$  will bind to the antigen and  
release cytokines, which stimulates formation  
formation of B cell clones of cell cell.  
so B cell will differentiate to form plasma  
cell, plasma cell will produce antibodies.



An example of a response scoring six marks.

## Question 6 (c)

Candidates, on the whole, did not score well on this question. There was some confusion over what was in whose blood.

(c) Suggest why a baby born with rhesus disease can be treated by replacing all their blood with blood from a healthy person.

(2)

The blood of the healthy person will not have antibodies for the rhesus antigen and thus it will not destroy the ~~own~~ red blood cells. It may also not contain red blood cells with rhesus antigens so the antibodies will not attach red blood cells at all. Eventually the antibodies will be excreted from the baby since they were inherited by the mother (natural passive immunity).



One of the better responses.

## Question 7 (a)

Candidates have clearly learnt the sequence of events which take place in the light-dependent reactions. The only mark point rarely seen was the first one which provides the main answer to the question.

- 7 Photosynthesis consists of the light-dependent and light-independent reactions. Photosynthesis produces GALP. A molecule of GALP contains hydrogen.

(a) Explain how the light-dependent reactions enable hydrogen to be incorporated into GALP.

(4)

• In light-dependent reaction, when light ~~is~~ is absorbed <sup>to higher</sup> by photosystem (II), the electrons are excited, ~~and~~ ~~an~~ energy level and passes to photosystem I through electron-transport chain. In order, to replace electrons lost from photosystem II, the ~~the~~ <sup>water</sup> is split by photolysis to ~~the~~ hydrogen ion, electron and oxygen. The hydrogen ion is needed in the ~~Calvin cycle~~ light-independent stage to convert ~~the~~ <sup>triose phosphate</sup> triphosphate to ~~a~~ GALP by ~~reductions~~ ~~the~~ ~~reducing~~ losing Hydrogen ion from reduced NADP.



This response gained full marks.

~~During~~ When a photon falls on the photosystems, electron is released.  $H_2O$  is broken down into  $H^+$  and  $OH^-$ .  $H^+$  is picked up by a molecule of NADP and also the electron from PS.  $CO_2$  binds with RubP to form GP. The molecule of reduced NADP comes and reduces GP into GALP.



Another response which gained full marks.



Always use past paper mark schemes, alongside the relevant question paper, when preparing for exams.

## Question 7 (b)

Another example of where the candidates who used past papers to prepare for the exam did well; provided that their answer was comparative.

(b) Explain why an increase in temperature increases the rate of production of GALP.

(3)

- Increase in temperature means more kinetic energy, so more formation of enzyme-substrate complexes per unit time and faster rate of carbon fixation.
- RUBISCO catalyzes carbon fixation ( $\text{CO}_2$  binds to RuBP forming GP)
- Faster carbon fixation due to higher RUBISCO activity
- More GP produced and reduced to GALP /unit time.



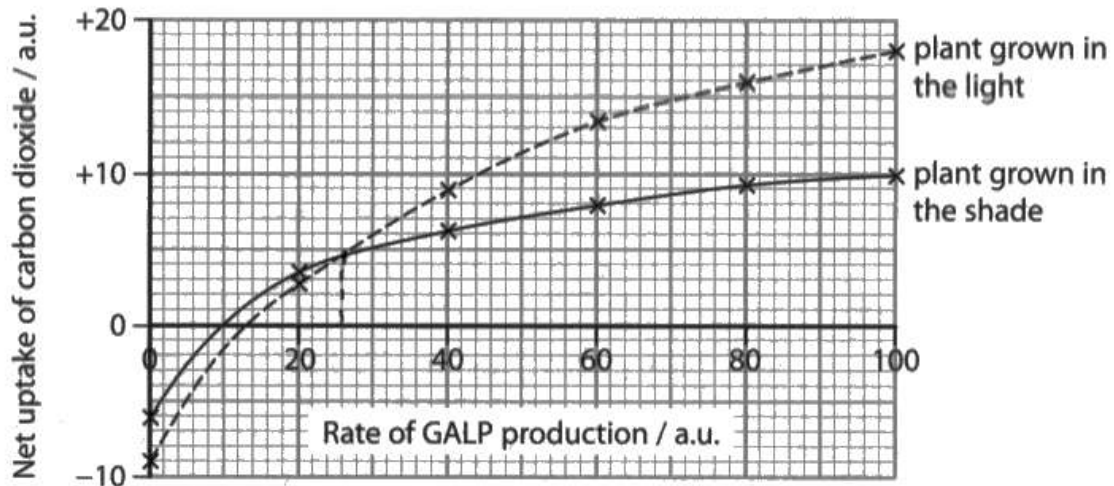
A response which gained full marks.



### Question 7 (c) (i)

This was another question which candidates could have revised from past paper mark schemes. Again, it relied on a comparative answer to be awarded the marks.

- (c) The graph below shows how the rate of GALP production affects the net uptake of carbon dioxide by two plants, one grown in the light and one grown in the shade.



- (i) Explain why the plant grown in the light had a greater net uptake of carbon dioxide than the plant grown in the shade, when the rate of GALP production was above 26 a.u.

(3)  
For  
1. The plant grown in the light, ~~will have~~ a ~~more~~ faster the light-dependent reactions will be faster so <sup>more</sup> NADPH and ATP will be produced, and RuBP will be carboxylated through carbon fixation of carbon dioxide faster, so more ~~GAP~~ or GALP will be produced by reduction of GP. For a plant in the shade, the light-dependent reactions are slower, so ~~more~~ less NADPH and ATP are produced, and convert GALP back into RuBP, and so less carbon dioxide is needed to produce the unstable 6-carbon intermediate that will produce GP.



This response was awarded mark points four and five, which were probably the most common.

## Question 7 (c) (ii)

Mark points one and two were both frequently awarded but the third point, which was more straight forward, was rarely seen.

- (ii) Suggest why the net uptake of carbon dioxide was negative when the rate of GALP production was very low.

(2)

~~photo~~ Low rate of GALP production means low ~~rate~~ rate of photosynthesis, thus respiration is occurring at a faster rate than photosynthesis (more carbon dioxide being used up than is taken in)



This illustrates the first mark point, which was seen most frequently.

Since less GALP is produced less RUBP ~~is~~ is regenerated. Less RUBP means less CO<sub>2</sub> reacts with it therefore it is negative.



This was awarded the second mark point.



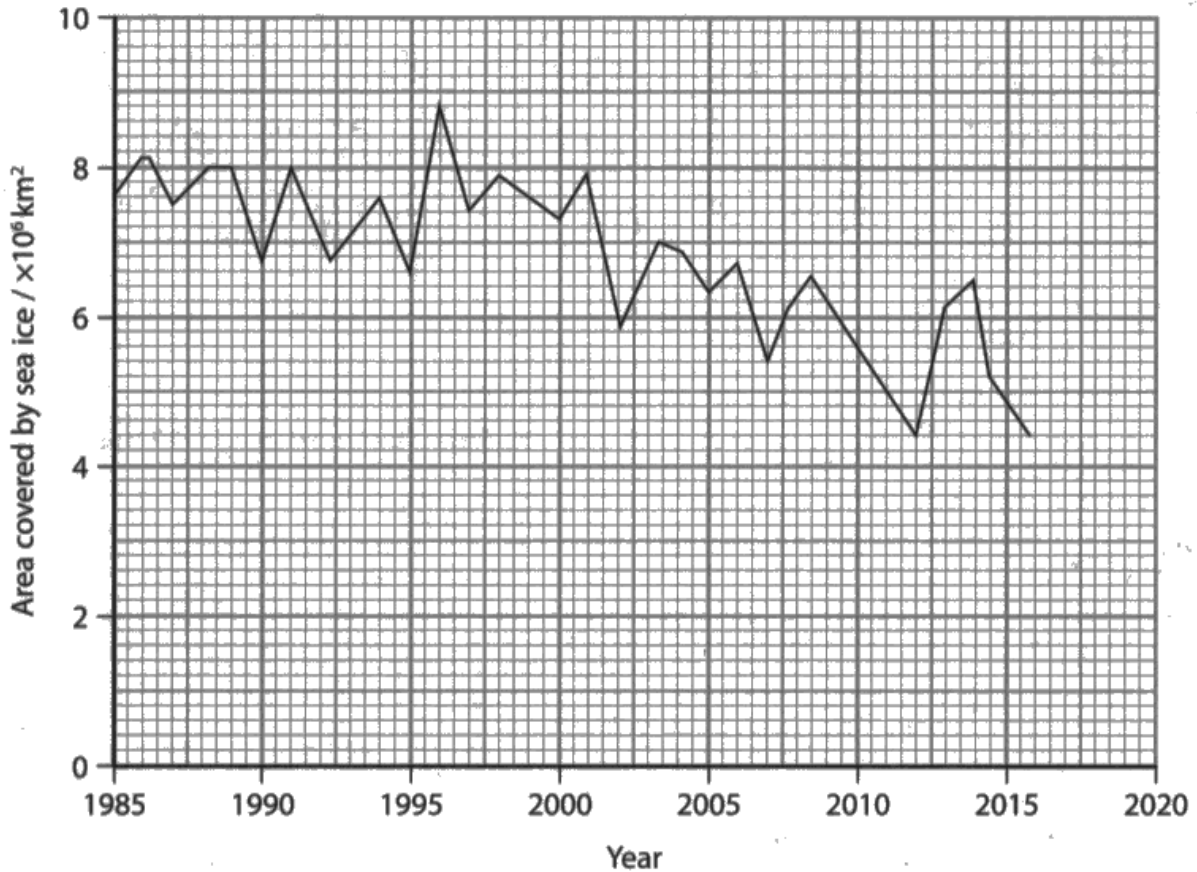
If there are two marks allocated to a question, you should make two points.

### Question 8 (a) (i)

Mark point one was awarded to candidates who had revised with the aid of past paper mark schemes and knew that they should always provide the **mean** increase in temperature. The third mark point was easily achieved, however, mark points two and four were seen less frequently.

8 Global warming is thought to be responsible for the decrease in area covered by sea ice.

(a) The graph below shows the changes in the area covered by sea ice in the Arctic between 1985 and 2016.



(i) Explain why global warming is thought to be responsible for this decrease.

(3)

Global warming is the increase in the mean temperature of the Earth's surface. This increase in temperature leads to the melting of ice, and this can be shown as the area covered by sea ice decreased by  $3.2 \times 10^6 \text{ km}^2$  between 1985 and 2016.



An example of a good answer.

## Question 8 (a) (ii)

Some responses to this question were not complex enough. We saw many answers which simply stated that extrapolation should be done or that a computer should work it out.

(ii) Describe how this graph could be used to estimate the area covered by sea ice in 2020. (2)

By extrapolating data, making predictions from graph, as there was a steady decrease from 2000 to 2015, can predict further decrease in 2020.



A typical response, gaining the additional guidance mark.

A line of best fit should be drawn and the line should be extrapolated to 2020. The value of area covered should be read off the graph.



An example of an excellent answer.

## Question 8 (a) (iii)

Candidates had the right idea for this question but did not gain marks as their responses were either too vague or did not include sufficient points.

(iii) Explain why a prediction of the area covered by sea ice in 2020, using the data in this graph, could be wrong.

(3)

~~we require evidence~~ The trend may not continue in the future. The degree of global warming could be reduced by reducing carbon dioxide emissions. Nevertheless global warming could increase by 2020 causing a sharp decrease than expected. ~~The graph~~ Moreover the graph has large ~~various~~ fluctuations.



This response illustrates mark points four, two and one.



If there are three marks you must write about three ideas.

## Question 8 (b) (i)

As the question asks for the amount of "berries", implying the whole, we did not consider it appropriate to provide a fractional answer. Ideally, candidates rounded the number up to 53,334 as rounding down produces a number which does not equate to the mass of a seal and, therefore, does not answer the question.

(b) The reduction in area covered by sea ice is affecting the behaviour of polar bears.

Some polar bears are staying on the ice-free areas, feeding on goose eggs, berries and, occasionally, caribou. Previously, these polar bears fed on seal blubber.

The table below gives some information about these food sources.

Food source	Mean mass / kg	Fat content / g kg <sup>-1</sup>	Energy content / J kg <sup>-1</sup>
one seal	160.000	862	32 424
one goose egg	0.144	139	5397
one berry	0.003	3	1344
one caribou	140.000	34	5334

(i) Calculate how many berries have the same mass as one seal.

(1)

$$\frac{160}{0.003} = 53333 \text{ kg berries}$$

Answer 53333



A clear calculation given to a whole number.



When answering mathematical questions, consider your answer within a biological context. It is important that candidates read the question carefully in order to understand what they should include.



## Question 8 (b) (ii)

We saw some excellent answers to this question, with candidates having some good ideas about the various implications of a change in behaviour. Marks were not gained either because the answers did not go into sufficient detail; for example, "the bears will get cold", or else did not cover enough different ideas.

- (ii) Using the information in the table, explain why scientists are concerned that this change in behaviour could result in a decrease in the number of polar bears.

The energy content of consuming one seal is much higher than <sup>(4)</sup> consuming goose egg, berry and ~~car~~ caribou. The polar bears have to ~~had~~ large ~~intake~~ consume large amount of the goose egg, berry and caribou in order to obtain the same energy content and fat content as consuming one seal hubber. It will become very competitive. Some did not consume enough will have less energy and fat content, couldn't withstand the extreme temperature at the Arctic. Eventually causing death due to environmental factor, thus result in a decrease in the number of polar bears.



A good response scoring full marks.

Because the goose egg, berry, caribou have a much smaller<sup>(4)</sup> fat content and energy content. one caribou has 27,090 J kg<sup>-1</sup> less energy content than one seed. There will be more competition among the bears for this food because a lot would be needed by each bear to avoid starvation and malnutrition. The food does not provide enough energy needed for movement and survival. So more polar bears die posing the risk of extinction.



This illustrates mark points one, three and four.

## Paper Summary

Based on their performance on this paper, candidates are advised to:

- use past papers to prepare for the exam, ensuring that the answers are tailored to the question
- use the mark allocation for guidance on the sufficient number points required in each answer
- include A level detail in the responses in order to score the higher marks
- show all the working in calculations and think about an appropriate number of decimal places to express the answer in
- if a question is about the effect of an increase or decrease in a factor, the answer must have a comparative element to score full marks.

## Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>



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