



Pearson

Examiners' Report

June 2017

IAL Biology WBI04_01

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.



Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus. Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2017

Publications Code WBI04_01_1706_ER

All the material in this publication is copyright
© Pearson Education Ltd 2017

Introduction

In general, this paper performed well with a wide range of responses being seen that covered all our mark points. There was no evidence that any one particular question caused significant problems, although some components were definitely more challenging than others. Nevertheless, even these were attempted by candidates with very few questions left completely blank. Probably the most challenging questions were 4(b)(i) and (ii) on the seaweeds, where information from two visuals had to be considered and 7(c)(i) which was a novel way of assessing the events taking place in mitosis. The multiple choices saw a range of distractors chosen but with each question answered correctly by the majority of candidates.

Question 1 (c)

Candidates are accustomed to questions on photosynthesis and recognising reaction J did not cause a problem. We saw some very good responses, some of which scoring all four of our mark points.

(c) Explain how reaction J is involved in the production of ATP in chloroplasts.

(3)

When light falls onto photosystems ^{in the thylakoid membrane} it stimulates the release of an electron from the photosystem ^(PSII), and this electron is accepted by an electron carrier and passed from one electron carrier to the next in a series of redox reactions. ^{releases energy and} At each this transfer allows H^+ ions to be accumulated in the thylakoid space creating an electrochemical gradient between the thylakoid space and stroma. This gradient then allows H^+ ions to return to stroma via facilitated diffusion through the ATPase enzyme, this H^+ releases energy and allows ADP to bind to inorganic phosphate to form ATP. The ATP is diffused out to the stroma for the light independent reaction / calvin cycle.



ResultsPlus Examiner Comments

This response illustrates all four of our mark points. The one that was seen least was the last point as some candidates do not seem to realise that the energy needed to phosphorylate ADP comes from the flow of protons through the ATPase channel.

Question 1 (d)

As with the previous question, this did not cause candidates too many problems.

(d) Explain the roles of ATP and reduced NADP in the light-independent reaction.

(3)

- ATP is involved in GP reduction in the Calvin cycle:
 - 2 3-carbon GP get reduced to 2 3-carbon GALP using energy from ATP and hydrogen ions from reduced NADP
 - GALP can then be converted into organic molecules such as carbohydrates, lipids, amino acids
- ATP is also needed to regenerate RuBP so that the Calvin cycle can restart (GALP is also needed in the stage of RuBP regeneration)



ResultsPlus
Examiner Comments

This response illustrates all four of our mark points.

Question 2 (a)

Candidates are familiar with questions on decomposition. This question did not cause too many problems except to those candidates who had not read it carefully enough and therefore did not pick up the fact that they were being asked about the decomposition of starch.

(a) Suggest how the starch content of the pine needles is decreased in phase 1.

(2)

- decomposers = bacteria + fungi release enzymes which break down starch by hydrolysis to α -glucose.
- starch decreased.
- they break down 1,4 and 1,6 glycosidic bonds.



ResultsPlus
Examiner Comments

This response was from a candidate who clearly had read the question carefully. All three of our mark points could be awarded.

(a) Suggest how the starch content of the pine needles is decreased in phase 1.

(2)

Saprotrophic bacteria and fungi release enzymes e.g.:
cellulase which carry out extracellular digestion \therefore
the starch breaks down to glucose as the 1,4 glycosidic bonds
between glucose molecules are broken \therefore the mass
decreases in phase 1.



ResultsPlus
Examiner Comments

This candidate unfortunately named the enzyme as cellulase even though they had picked up on the question being about starch.



ResultsPlus
Examiner Tip

Always read your answer through carefully to make sure that you have not made any careless mistakes.

Question 2 (b)

This calculation was fairly straightforward for the candidates who looked at the data carefully enough and selected 780g as the appropriate starting mass and not 900g. We did allow one mark in the mark scheme for candidates who had made this mistake.

(b) Calculate the percentage of mass lost in phase 2.

(2)

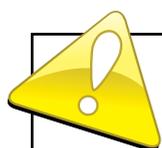
$$\frac{780 - 180}{780} \times 100 = 76.9 \%$$

Answer 76.9 %



ResultsPlus Examiner Comments

A well laid out calculation with the answer rounded up to a sensible number of decimal places.



ResultsPlus Examiner Tip

Always show your working. It is very easy to make a simple mistake under exam conditions so you do not want to forfeit all the marks by only writing down a wrong answer.

Question 2 (c)

This response was answered well by those candidates who compared the structure of starch and cellulose and not the properties or function.

(c) The breakdown of the starch in phase 1 and of the cellulose in phase 2 is related to their structure.

Compare the structure of cellulose with that of starch.

(2)

cellulose is a straight chained molecule, starch is branched (as it contains amylopectin). Both cellulose and starch are polymers (polysaccharides) But cellulose is a polymer of beta glucose, starch is a polymer of alpha glucose. Starch has 1,6 and 1,4 glycosidic bonds, but cellulose has only 1,4 glycosidic bonds.



ResultsPlus

Examiner Comments

Three of our four mark points are in this response, mark points 4, 1 and 2.



ResultsPlus

Examiner Tip

In compare questions, remember to make each comparison in the same sentence. Do not write two descriptions and assume that the examiner will pick out the comparative points.

Question 2 (d)

For the candidates who had revised their AS content, this question caused little problem.

(d) In phase 3, lignin is broken down.

Describe the role of lignin in xylem vessels.

(2)

- lignin waterproofs the xylem vessels and gives strength.
- makes xylem vessels hollow
- xylem vessels transport water and mineral ions.



ResultsPlus

Examiner Comments

This a clear response, illustrating both our mark points.



ResultsPlus

Examiner Tip

Remember that both A2 papers will test you on the AS content.

Use the allocated marks to help you structure your answer. If you are asked about the role and there are two marks, this indicates that you should describe two roles.

Question 3 (b)(i)

This question performed less well than the other compare question (starch v cellulose); more candidates structured their answer as two descriptions.

- (i) Compare the growth of *P. aurelia* with the growth of *P. caudatum* when the two species are grown in separate cultures.

In general

(3)

For both species, number of *P. caud* and *P. aurelia* increased with time. There for both species increase in growth. From 0 to 2 days both species stay constant in number, but number of *P. aurelia* starts to increase earlier (ie day 2) than *P. caudatum* (ie day 5). Number of *P. aurelia* increased more times (ie increased by almost 600 units) than *P. caudatum*. Number of *P. caudatum* plateaus earlier than *P. aurelia* and ^{plateau}remains constant longer.



ResultsPlus Examiner Comments

This candidate made a really good attempt at writing a comparative answer. Mark points 1, 4 and 3 can be awarded.

- sm → af
- (i) Compare the growth of *P. aurelia* with the growth of *P. caudatum* when the two species are grown in separate cultures.

(3)

Both species show an overall increase in number over time. From 0-2 days the increase in number of both species are almost the same and at 2 days there are 20 of each species. The number of *P. aurelia* increases at a faster rate and the overall increase in number is by 580. The *P. caudatum* increases in number much more slowly and the overall increase in number is by 190. At all times after 2 days the number of *P. aurelia* is greater than *P. caudatum*. For *P. aurelia* the number stops increasing from 12 days (remains constant) whilst for *P. caudatum* it stops increasing from 10 days onwards.



ResultsPlus
Examiner Comments

Mark points 2 and 4 can be awarded for this response.



ResultsPlus
Examiner Tip

Simply quoting values from a graph that are different is not sufficient for a comparison; actual statements need to be made about the differences shown.

Question 3 (b)(ii)

This question did cause candidates problems as they compared the data within one graph and not between the three graphs.

steep increase to 200 at day 10 and stays constant till day 12.

(ii) Describe how culturing *P. aurelia* and *P. caudatum* together affected the growth of each species after 10 days.

(2)

By culturing them together they now share the same habitat so they showed a decrease in growth for each species. By day ~~12~~¹⁰ the *P. Aurelia* number was at ~~340~~²⁸⁰ which is ~~27~~²³⁰ less than when it was grown separately and the *P. caudatum* was at 80 which is 120 less than when it was grown separately.



ResultsPlus

Examiner Comments

This candidate did score both our mark points.

Question 3 (b)(iii)

Candidates clearly know the meaning of the term niche but many do not realise that two species can coexist if they share the same niche.

(iii) Explain how the results of these experiments support the concept of niche.

(3)

A niche is the specific role that an organism plays in its habitat. eg. being a source of food to another organism. ~~It is~~ Two species cannot live in the same habitat if they have similar requirements. In this case both the species are feeding on bacteria, so there is a competition for food. More bacteria are eaten and less is available. Less bacteria means the populations don't have enough energy for replication so the numbers are limited to that of when they lived separately.



ResultsPlus
Examiner Comments

We felt that there was enough in this response to award mark point 3. Mark point 2 is also here.

These two species of Paramecium occupy the same niche where both feed on the same type of bacteria. Because of limited food source, there was interspecific competition between the two species for the same bacteria where *P. aurelia* successfully outcompeted *P. caudatum* where levels of *P. aurelia* and *caudatum* both decreased compared to when grown separately. This suggests the niche concepts.

(Total for Question 3 = 11 marks)



ResultsPlus
Examiner Comments

Mark points 2 and 1 were awarded for this response.

Question 4 (a)

As in previous papers when we have asked this question, many candidates started their account with details of the structure of cellulose and then wrote little more after the hydrogen bonds, assuming that they had written enough for 3 marks. As a result, this question was not as mark yielding as maybe it should have been.

(a) Describe the structure of a plant cell wall.

(3)

Plant cell wall is made of cellulose microfibrils.

They are arranged in a criss-cross manner embedded in a glue of hemicellulose and pectin. This is the primary cell wall. They are arranged in parallel sheets running in one direction, embedded in a glue of hemicellulose and pectin to form the secondary cell wall. There are hydrogen bonds between the ~~ce~~ parallel cellulose molecules that make up the cellulose microfibril.



ResultsPlus
Examiner Comments

This is a very clear account of the structure of the cell wall scoring mark points 3, 4, 1 and 2.

A plant cell wall is composed of cellulose, a polymer of beta glucose, ~~to the~~ between cellulose molecules are hydrogen bonds forming microfibrils. There ~~are~~ ~~is~~ is a primary cell wall, which consists of cellulose embedded in a matrix of hemicellulose arranged in a crisscross manner at different angles for mechanical strength and a secondary cell wall which also has lignin



ResultsPlus
Examiner Comments

This account has been included to illustrate our fifth mark point.



ResultsPlus
Examiner Tip

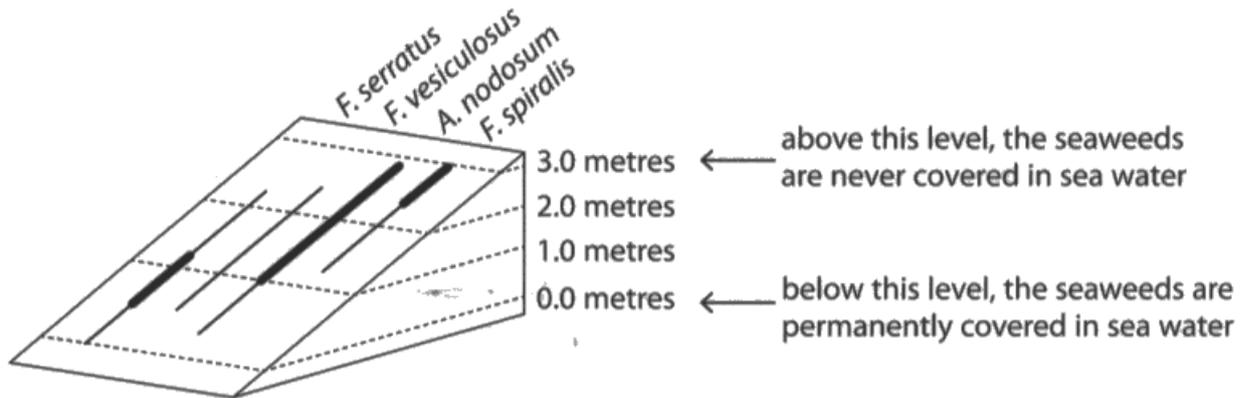
Read the question carefully to ensure that you are answering the question that has been asked. Also, if you find yourself writing down information that you have done so already, it is likely that you may have mis-understood what is being asked for in one of the questions. In this case, question 2c had already tested you on the structure of cellulose.

Question 4 (b)(i)

This question was very challenging as it was asking the candidates to assimilate information from two visuals. The context may also have been unfamiliar but sufficient information was provided for the candidates to access the question.

On the diagram below, each line represents the abundance and distribution of these seaweeds on a seashore.

The length of the line shows where each seaweed is found. The thickness of the line shows how much of each seaweed is present.



(i) Use the information in the table and the diagram to explain the distribution of these seaweeds on the seashore.

Fucus serratus grows ^{best when it is} closest to the low-tide mark, ^{at a 0.5-1 m} (4)
 (0.42 μm)
 it has the thinnest cell walls, so water can diffuse out easily when exposed to air. Thus it needs to be covered by water more than the others.

A. nodosum grows best from $\approx 1 - 3\text{ m}$, as it has a ~~medium~~ ^{over} cell wall of medium thickness (1.02 μm). It ~~is so~~ is capable of growing successfully ~~at~~ a large range. ~~of water~~ It is not outcompeted by *F. spiralis* or *F. vesiculosus*, but is outcompeted by *F. serratus* below ~~the~~ the 1 m mark.

F. spiralis grows best from $\approx 2.5 - 3\text{ m}$, as it has the thickest cell wall (1.42 μm) and thus the best water retention. It is outcompeted by *A. nodosum* below the $\approx 2.5\text{ m}$ ~~mark~~ mark. *F. vesiculosus* doesn't grow very well at any ~~low~~ level, as it is outcompeted by *F. serratus* ~~at~~ below 1 m, and *A. nodosum* above 1 m. As the thickness of

the cell wall increases, ~~the~~ better the seaweed is better ~~is~~ adapted to survive at a higher level, as it can last longer without being covered by water.



ResultsPlus

Examiner Comments

This response illustrates mark points 4, 3, 5, 2 and our overall descriptive mark, mark point 1.



ResultsPlus

Examiner Tip

When you see the command word 'explain' you will not score many marks for a description of the data. You may find it easier to start off with a description and then say 'because ...'.

If you do not know where to start, look for the clue at the start of the question. In this case you were asked about cell wall structure to indicate to you that this question had something to do with cell walls. You were then given a table about cell wall thickness in seaweeds and then some data in a diagram. Think what you know about the function of cell walls and this should then help you answer the question.

Question 4 (b)(ii)

On the whole, candidates made a good attempt at this question provided they applied the principles of field work e.g. using a transect to measure changes along a gradient, using systematic sampling for transects, using quadrats for determining abundance. There were still too many candidates that write 'repeat' and expect to get a mark. We need to know precisely what is being repeated and where appropriate, what is going to be done with the repeated data. In this case, several separate transects need to be done.

* (ii) Describe how an investigation could be carried out to compare the distribution and abundance of these seaweeds on another seashore.

(6)

A area on the seashore is selected for sampling. Systematic sampling called a transect sampling is done perpendicular parallel to the sea shore from 0 meters to 3 meters above the sea level.

A meter measuring tape is placed on the transect that is perpendicular to the sea. This is placed during low tide when water level is below 0 meters. Then a grided quadrat

A grided quadrat 1m x 1m is placed on the ~~transect~~ transect at regular intervals of 0.5 meters.

The no. of squares covered by each species of seaweed is counted.

The % abundance is found by
$$\frac{\text{no. of squares covered by type of seaweed} \times 100}{\text{total no. of squares}}$$

The % abundance is found at every interval of 0.5 meters

Then ~~is~~ ~~is~~ ~~repeated~~ the whole procedure is repeated on another transect parallel to the initial transect

% mean % abundance for each sea level above the sea is found. Then repeating the transect is placed on places with

similar condition as the first transect such as light intensity, soil water content, pH. Also same quadrat is used.

Then make a table of ^{sealevel in meters} (Total for Question 4 = 13 marks)

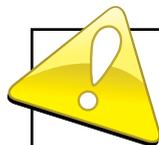
and ^{mean} % abundance of each species of seaweed



ResultsPlus

Examiner Comments

This was an excellent response, illustrating all our mark points.



ResultsPlus

Examiner Tip

In general, describe the use of the most significant pieces of equipment (or named chemicals if appropriate), explain precisely what measurements need to be taken, and describe what you will do with the data, describe the measurement or control of the variables.

Question 5 (a)

A surprisingly high number of candidates think that all viruses behave like HIV. We saw lots of accounts of reverse transcriptase being used to make a DNA copy of the RNA and integrated into the host DNA to form a provirus using integrase, and then the DNA being transcribed into mRNA. We did not penalise these candidates for subsequent descriptions of protein synthesis, but it did mean that they could not access the RNA synthesis marks.

*(a) Explain how protein and copies of the poliovirus RNA are synthesised from the poliovirus RNA.

(6)

The viral RNA is transcribed using RNA polymerase and mononucleotides from the host cell. Individual mononucleotides line up against the viral template RNA, and according to rules of complementary base pairing. Adjacent mononucleotides are joined by phosphodiester bonds catalysed by RNA polymerase. The mRNA produced is then translated. The ^{viral} mRNA attaches to the host ribosome. The start codon AUG codes for an amino acid methionine. A tRNA molecule binds to the specific amino acid which has been activated by ATP, and carries it to the ribosome. The complementary tRNA anticodon binds to the mRNA codon via hydrogen bonds. 2 tRNA molecules with their amino acid can be held in the ribosome at a given time. 2 amino acid molecules are joined by peptide bonds catalysed by peptidyl transferase. ~~Recess~~ Ribosome moves 1 codon in front. This process continues until a stop codon is reached. Translation will produce a polypeptide chain (primary structure) which will fold helped us types and positions of R groups leading to different ionic hydrogen and disulphide bonds to be formed. This is the tertiary structure e.g. viral protein coat.



ResultsPlus

Examiner Comments

This candidate had clearly looked very carefully at the diagram and applied their knowledge to the synthesis of polio virus particles. We awarded mark points 8, 1, 7, 3, 4, 5 and 2.



ResultsPlus

Examiner Tip

If a question has been set in an unfamiliar context, you are expected to apply your knowledge not write about something you have not been taught. Identify the topic of the question, look carefully at the information that you have been given and then try and put your answer together.

Question 5 (b)(i)

A range of answers were seen in response to this question. There were a number of candidates who clearly knew the meaning of the term but could not express themselves clearly enough.

(b) Vaccines are available for immunisation against polio.

These vaccines result in artificial active immunity.

(i) Explain the meaning of the term **artificial active immunity**.

(3)

It is artificial as the immunity is obtained by giving ~~the~~ ^{the} vaccines ~~artificial~~. The vaccines ~~result~~ trigger primary immune response in the person as they contain ~~antigen~~ ^{antigen} of virus. Then ~~the~~ B cell ~~develop~~ is stimulated and differentiate to plasma cell and memory cell. ~~The~~ ~~memory~~ ~~cells~~ The T lymphocytes also form memory cells. These memory cells provide immunity ~~against~~ ^{when} ~~it~~ infected again by the virus. The ~~vaccine~~ contain attenuated virus or antigen of virus so does not cause disease. ~~The~~ ~~memory~~ cells cause secondary immune response.



ResultsPlus Examiner Comments

We did award this response all three marks. We had hoped to award a mark point for the word 'injection' but so many candidates referred to 'giving' the vaccine, that we loosened the mark point.



ResultsPlus Examiner Tip

Generally speaking there will be a mark for each word in the term that is being defined. Therefore ensure that you explain each word. In this case you had to say what artificial means, what active means and what immunity is.

Question 5 (b)(ii)

Candidates did identify that we were really after a description of the primary immune response, resulting in the production of memory cells and longterm immunity. However, a large number launched into a straightforward recall of previous mark schemes without actually answering this specific question.

There were a number of candidates who thought T helper cells became T killer cells and B cells following antigen presentation by the macrophages.

(ii) Explain why vaccines against polio contain inactive forms of all three strains of poliovirus. (4)

Because if polio was active it would've infected the cells. This is why 3 strains of poliovirus is injected to allow the person to develop immunity against all 3. Because poliovirus can come in any strain, memory cells are made to recognise these antigens if infected. This means the secondary response against all 3 strains will be much quicker as the primary response is already been gone through by vaccination. T helper cells will activate B cells and T killer cells which will produce memory cells against these 3 strains.



ResultsPlus

Examiner Comments

This candidate had clearly considered the context of the question and then applied their knowledge to this context, scoring five of our seven available mark points.



ResultsPlus

Examiner Tip

Past paper mark schemes are very useful in helping you prepare for an examination as they will help you realise the level of detail and wording that you are expected to have at this level. However, you must apply these mark schemes to the context of the question in front of you.

Remember that viruses are not alive, therefore our cells cannot kill them.

Question 6 (a)

This should have been a straightforward start to this question.

Type of salmon	Mean mass of salmon / kg	Mean length of salmon / cm
Atlantic salmon	1.3	33.0
GM salmon	3.0	61.0

(a) Use the information in the table to describe the differences in these two types of salmon after 18 months.

(2)

GM salmon is much heavier than Atlantic salmon, (1.7 kg more) and it has a greater length as well (28cm more).



ResultsPlus

Examiner Comments

This is an example of the response to this question that we were hoping to see .



ResultsPlus

Examiner Tip

Even if a question looks straightforward, do not rush through it. You are not going to get two marks for simply stating that the GM salmon is heavier and longer than the Atlantic salmon. There is not much else you can say so the answer must be expecting a calculation to be done.

Question 6 (b)(i)

Candidates who thought about what the line on a graph represents scored well on this question. There were a number of candidates who assumed that the data should always start at the origin and therefore entered the wrong values into their calculation.

- (i) Use the information in the graph to calculate the mean growth rate of the Atlantic salmon during this time period.

(3)

$$\begin{aligned} \text{growth rate} &= \frac{\text{final mass} - \text{initial mass}}{\text{time taken}} \\ &= \frac{1300 - 100}{16} \\ &= 75 \text{ g/month} \end{aligned}$$

Answer 7.5 g per month



ResultsPlus
Examiner Comments

An example of a clearly laid out calculation.

- (i) Use the information in the graph to calculate the mean growth rate of the Atlantic salmon during this time period.

(3)

$$\frac{1300 - 100}{100} \times 100 = 1200$$

Answer 1200 g/months



ResultsPlus
Examiner Comments

A clearly laid out calculation that enabled the candidate to score one mark even though they did the wrong calculation. If they had shown no working and simply written that answer down they would have scored no marks.



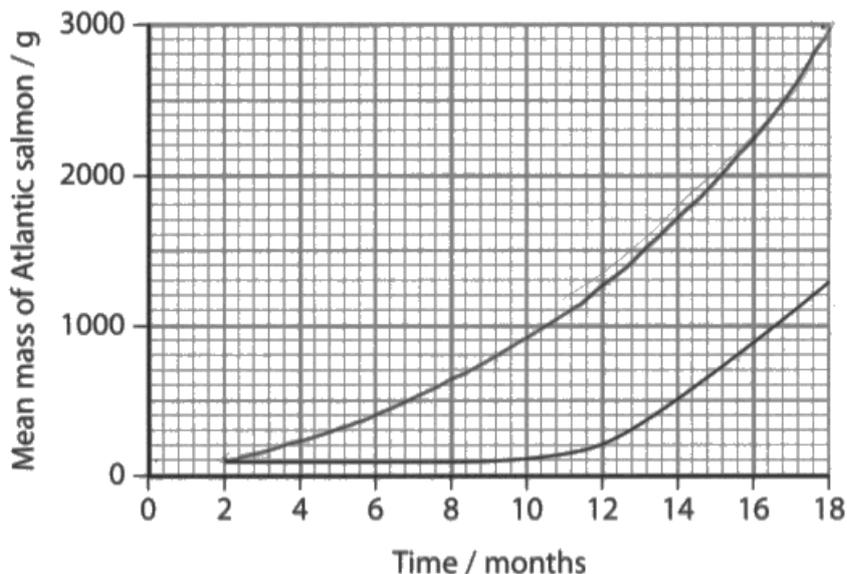
ResultsPlus
Examiner Tip

Always show your working as you may pick up method marks even if you do not arrive at the correct answer.

Question 6 (b)(ii)

We do not often ask candidates to complete a graph on this paper but they did not seem phased by it. However, there were candidates who automatically drew their line through the origin.

(b) The graph below shows the increase in mass of an Atlantic salmon.



(i) Use the information in the graph to calculate the mean growth rate of the Atlantic salmon during this time period.

(3)

initial ^{mean} mass of Atlantic salmon

$$= 100\text{g}$$

final mean mass of salmon

$$= 1300\text{g}$$

$$\frac{1300 - 100}{16} = 75$$

Answer 75 g months⁻¹

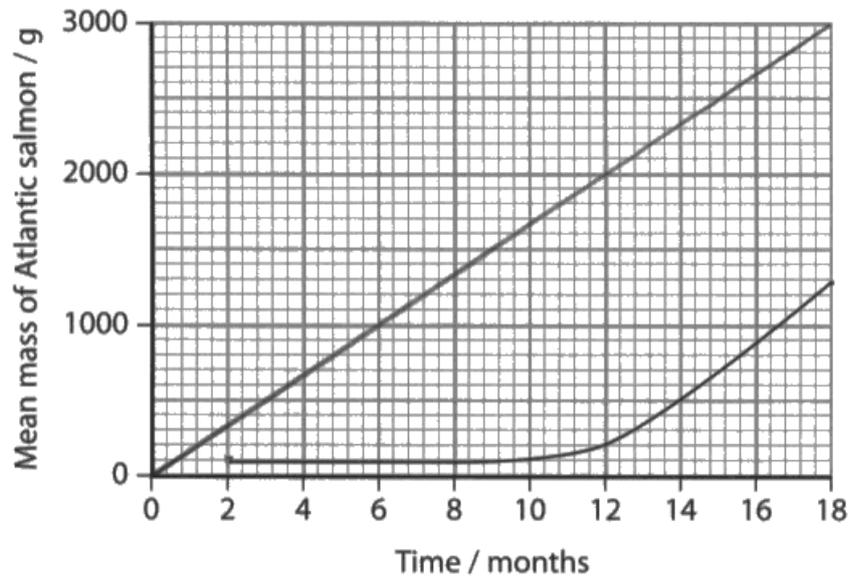
(ii) On the graph, draw a line to show the probable increase in mass of the GM salmon over the same time period.



ResultsPlus
Examiner Comments

This is what we were expecting.

(b) The graph below shows the increase in mass of an Atlantic salmon.



(i) Use the information in the graph to calculate the mean growth rate of the Atlantic salmon during this time period.

(3)

$$\frac{1300-100}{18-2} = 75 \text{ g per month}$$

Answer 75g per month.

(ii) On the graph, draw a line to show the probable increase in mass of the GM salmon over the same time period.



ResultsPlus

Examiner Comments

Drawing the line through the origin was the commonest error made in this question.



ResultsPlus

Examiner Tip

This is another example of not rushing a seemingly straightforward question. Look carefully at the data and information that you have been given and think; you have approximately a minute a mark so you have the time to do so.

Question 6 (b)(iii)

This question caused more problems than we anticipated. We think that candidates rushed into their response without really thinking. We saw a surprisingly high number of candidates who described measuring the dry mass of the salmon at the start of the experiment, putting the salmon back in the water and then measuring the dry mass again at the end of the experiment.

(iii) Describe an experiment that could be carried out to confirm the increase in mass of the GM salmon for this time period.

(3)

Measure the initial mass of the salmon.

Carry the experiment under the same conditions, temperature, oxygen concentration.

The salmon should be of same species, gender, age.

Measure the mass of the salmon at regular time intervals.

Repeat for more than one salmon and calculate the mean.



ResultsPlus
Examiner Comments

Very few candidates, like this one, scored mark point 1.

(iii) Describe an experiment that could be carried out to confirm the increase in mass of the GM salmon for this time period.

(3)

GM salmon ^{egg} will be collected and placed in different ~~beakers~~ glass tanks containing water. Temperature ^{and} pH of water will be kept constant, ~~by using~~ with an incubator and a buffer solution. ~~be each glass be~~ As soon as all the eggs hatch, different amounts of food will be given to the ^{GM} salmon in each tank. The GM salmon will be left for 16-18 months and masses will be measured. The experiment will be repeated at least 3 times.



ResultsPlus
Examiner Comments

This candidate was one of the few who did score mark point 1, but then nothing else.

Question 6 (c)(ii)

Very few problems encountered with this question, except by those candidates who simply said 'compare the bands' or used an unacceptable alternative to the term 'bands' e.g. fragments.

(ii) Describe the differences in the DNA that might be seen using this process.

(2)

The number, size and width of bands would be different.

There would be two different sets of DNA bands which confirms that 2 species are present.



ResultsPlus
Examiner Comments

This response scored two marks.



ResultsPlus
Examiner Tip

Look at the marks allocated to each question. You will not get two marks for saying one thing.

Question 7a (ii)

Candidates who read the question knew that mitosis would increase the number of T killer cells and some would continue their response and give mark point 2. Mark point 3 was less frequently seen.

There were a number of candidates who clearly word spotted, saw mitosis and wrote about B cells dividing so that they could form lots of plasma cells to produce antibody. These candidates had obviously seen one of our earlier papers.

(ii) Explain the importance of mitosis in the proliferation of activated T killer cells.

via the presence of ~~the~~ ^{cytokine} from activated T helper ⁽²⁾ cells.
The activated T killer cells will divide by mitosis to form a large number of a T killer cell population will form specific to the antigen on the virus. They will form pores and lead to cell lysis and so viruses are more easily engulfed. Mitosis is also needed for the increase / replication of ^{of activated} T helper cells which produce cytokines to activate the replication of ~~replicating~~ the T killer cells.



ResultsPlus Examiner Comments

This candidate scored mark point 1 and 2. We saw quite a few references to 'easier' phagocytosis by those candidates who did attempt the idea of mark point 3.



ResultsPlus Examiner Tip

Something becoming 'easier' or 'more efficient' is quite often too vague so always consider if you need to be more precise.

Question 7 (a)(iii)

Candidates have a good understanding of how host-infected cells are destroyed by T killer cells.

(iii) Explain how virus-infected host cells are destroyed by T killer cells.

(2)

T killer cells bind to infected host cells.
T killer cell then released chemicals that
makes pores appear in the host cell membrane
and the host cell lyses and the virus
particles leave the cell.



ResultsPlus

Examiner Comments

This is a good example of some of the excellent responses that we saw for this question.

Question 7 (b)(i)

Candidates are used to being asked about the role of macrophages in phagocytosis or antigen presentation. This slightly different approach to the role of macrophages did throw some candidates. We read about macrophages presenting antigen directly to the T killer cells and how T helper cells become T killer cells following antigen presentation.

(i) Describe the role of macrophages in the activation of T killer cells.

Macrophages engulf the pathogen & display its antigen over MHC becoming an APC to T helper cells with complementary CD4 receptors. The selected clone of T helper cells secrete cytokines which activate & proliferate T killer cells with complementary CD8 receptors. ⁽²⁾



ResultsPlus
Examiner Comments

This candidate was not put off by this different approach to the role of macrophages.

Question 7 (b)(ii)

Candidates clearly appreciated that macrophages play a role in virus destruction by engulfing them. However, as we have seen in the past, there are several candidates who write about the virus being killed.

(ii) Describe the role of macrophages in the destruction of viruses.

(3)

The released virus particles are engulfed by phagocytosis where pseudopodia extend and fuse to form a vacuole with the virus particle inside. Lysosomes in the macrophage fuse with the vacuole and release enzymes that break down and destroy the virus particles.



ResultsPlus

Examiner Comments

This response was awarded mark points 1 and 2. These points were made by candidates more frequently than the third point on our mark scheme.

Question 8 (a)(i)

We saw a number of reasonable suggestions for the need to preserve the eggs.

(a) (i) Suggest why some of the eggs were preserved in alcohol.

(1)

As a control for preservation for further investigation.



(a) (i) Suggest why some of the eggs were preserved in alcohol.

(1)

*To halt their development so it could be observed later
and to preserve them.*



Question 8 (a)(ii)

We had two possible reasons on our mark scheme and we saw them both, but rarely on the same script.

(ii) Suggest why some of the blow fly eggs were incubated with bear liver.

(2)

Scientists would do this to replicate their development as it is important to observe the length of their lifecycle (how long it takes to develop into adult blow flies)



ResultsPlus
Examiner Comments

This was an alternative answer for our first mark point.

(ii) Suggest why some of the blow fly eggs were incubated with bear liver.

(2)

Because when the eggs hatch, the maggots will start immediately start eating the ^{soft} tissue and so i.e., start early in liver. They will ~~not~~ then pupate and ^{form} the adult flies with ~~eat~~



ResultsPlus
Examiner Comments

This is what we were looking for in our second mark point. There were quite a number of candidates who thought that the liver was needed to keep the eggs warm.



ResultsPlus
Examiner Tip

There are two marks allocated for this suggest question, indicating that two suggestions are needed to gain full marks.

Question 8 (a)(iii)

This question caused very few candidates any problem.

Question 8 (a)(iv)

We had quite a list of possible reasons on our mark scheme for the eggs not all hatching at the same time and the majority of candidates were able to come up with at least one of them.

(iv) Suggest why all the eggs do not hatch at the same time.

(1)

Because some eggs might be ^{of different species.} ~~on parts of the river where temperatures~~ ~~are still~~



ResultsPlus
Examiner Comments

This was probably the most common suggestion.

(iv) Suggest why all the eggs do not hatch at the same time.

(1)

Because they were probably laid at different times.



ResultsPlus
Examiner Comments

This suggestion was seen quite often as well.

(iv) Suggest why all the eggs do not hatch at the same time.

(1)

Genetic variation



ResultsPlus
Examiner Comments

This suggestion was not seen quite so frequently but nonetheless it is a perfectly valid reason.

Question 8 (b)(i)

This question did not perform quite as well as expected, which was surprising as it was based on a core practical. Candidates tended to pick up mark point 3 and possibly one of the other two.

(i) Explain why the time taken for the eggs to hatch is dependent on the temperature.

As the ~~temperature~~ ^{temperature} increase ^{from 21.2 to 23.1°C (3)} the time taken for the eggs to hatch in maggots decrease. This is because the development of the egg is an enzyme catalysed reaction. So when temperature increase molecules gain more kinetic energy so more collisions between the enzyme and substrate so more enzyme substrate complexes are formed per second. So the metabolic reactions increase causing the egg to develop faster.



ResultsPlus
Examiner Comments

This candidate's response did score all three points from piecing together different parts of the answer to award mark point 2 at the end.

Question 8 (b)(ii)

This question did not perform as well as expected, particularly as we have asked about estimates of time of death in the past. It is possible that this is because it was the last question on the paper, although there was no evidence that candidates were short of time.

- (ii) The scientists estimated that the time of death was in the early hours of the 14th July.

Using the information provided, explain why the actual time of death could only be an estimate.

(2)

As environmental factors can vary eg: ^{temperature.} humidity would be different from the time the bear cub died to when it was found. Also blowflies wouldn't have laid eggs as soon as the bear cub died.



ResultsPlus
Examiner Comments

Mark points 1 and 4 are illustrated in this response.

The time taken for the eggs to hatch may vary according to temperature. Since the temperature in the forest is likely to have changed over time, we cannot accurately predict a time of death. L. illusoria has a very large range of times taken for the egg to hatch, so the time of death could be between 19.2 and 44 hours, so only a rough estimate is taken. Where as other ^{species} P. f. picea such as P. regina have a smaller range, which is affected by temperature.



ResultsPlus
Examiner Comments

Mark points 4 and 3 have been awarded for this response.

Question 8 (c)

Again, responses were variable for this question with candidates rarely scoring two points

(c) Explain why it is necessary to use several pieces of information to determine the time of death of an organism. • Use of other measurements like

nigor mortis. (2)

• the more different types of measurement, like decomposition is used the closer the ~~est~~ estimate and more accurate the estimate of time of death.

• time of death rate of death depends on many factors. ~~with~~ ^{like} ambient temperature, body mass.

- more accurate

(Total for Question 8 = 12 marks)



ResultsPlus
Examiner Comments

This is an illustration of what we were looking for in an answer to this question.

Paper summary

Based on their performance on this paper, candidates are offered the following advice, which is similar to what we have offered in the past:

- read the question thoroughly and do not just word spot
- use past paper mark schemes to prepare for the exam but make sure that the points learnt are applied to the context of the question and not just copied down verbatim
- use the command words to help write an appropriate response, in particular for an explain question, include reasons not just descriptions
- use the number of marks allocated to a question to check that enough points have been made in an answer
- when describing data include one calculation to quantify the response
- show all workings in a calculation
- if two visuals are included in a question, use information from both of them

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>

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London WC2R 0RL.

Ofqual
.....



Llywodraeth Cynulliad Cymru
Welsh Assembly Government

