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Examiners' Report
June 2015

GCSE Biology 5BI3H 01

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Introduction

This was the third time that the B3 unit has been examined in the science 2011 specification and the second time as part of a linear assessment model where all three exam units are examined at the end of the course. Candidates were able to use knowledge of other units in their explanations. It is taken by candidates doing GCSE biology or GCSE further additional science.

The paper consists of 60 marks assessed by a variety of questions including multiple choice, short answer and two extended answer questions worth 6 marks each. Candidates should answer all questions in a time period of 1 hour. The extended answer questions are also marked on their quality of written communication (QWC) so candidates should ensure that their answer includes good use of spelling and grammar and also that the answer is written with clarity.

The paper contained questions from all three topics from the unit. These included human evolution, immunisation and the immune response, selective breeding and biofuels, hormones of the menstrual cycle, the use of monoclonal antibodies in pregnancy testing and cancer treatment, ADH and the kidney, mycoprotein and the production of yogurt.

The candidates accessed both extended writing responses well and were able to demonstrate a very good level of knowledge and understanding on the kidney and describe data trends on the production of yogurt. Higher ability candidates did better at applying their knowledge on the growth of micro organisms and the production of yogurt.

Candidates of all abilities demonstrated the ability to calculate a mean. Many candidates were able to describe the trend of a graph although a surprising number struggled with the scale on the y-axis when extracting data from the graph.

Where there was specification overlap between questions on this paper and previous papers at both higher and foundation, candidates showed a particularly good level of knowledge indicating that they may have used the past papers in their preparation.

Candidates of all abilities were able to give some uses of stone tools and many were able to explain why mitochondrial DNA is used to track evolution. Many candidates gave examples of the structural changes that have occurred to describe how fossils showed evolution.

Candidates were able to suggest why outbreaks of a disease can occur even when there is an immunisation against it. Most candidates demonstrated good knowledge of the body's response to immunisation.

There were some good descriptions of selective breeding and many candidates could explain how the use of pesticides benefit maize production. Candidates gave balanced answers on the advantages and disadvantages of biofuel production but there were some misconceptions with some candidates suggesting that biofuels do not release greenhouses gases when they are burnt.

The use of monoclonal antibodies in pregnancy testing allowed candidates to demonstrate knowledge on a very specific area of the specification and many candidates were also able to explain the benefits of using monoclonal antibodies to treat cancer.

Some candidates were confused by diabetes insipidus even though it was explained and linked their answers to blood glucose regulation rather than osmoregulation. Very few candidates were able to give more than one cause for the variation of ADH in the blood of healthy individuals. Although most candidates could explain the role of ADH very few related the permeability of kidney tubules to the levels of ADH thus did not achieve maximum marks.

Candidates of all abilities were able to explain the benefits of mycoprotein and many were able to give good descriptions on how it is produced. Interpreting data on the production of yogurt and relating this to the production of lactic acid by mycoprotein proved challenging for lower ability candidates on the paper but allowed high ability candidates to apply their knowledge to a specific context and some very good detailed responses were seen.

Question 1 (a) (ii)

This question required the identification of two different uses of stone tools which would have helped early humans to survive. Hunting, weapons, fighting and defence were included in the same mark point as the use is essentially the same. Marks were also given for the preparation of food, making clothes, making shelters or other tools and making fire. The question was well answered across all abilities. Where marks were dropped this was often for giving two uses from the same marking point, for example hunting and fighting. Vague references to cutting things was insufficient for a mark.

(ii) Suggest how these tools may have helped early humans to survive.

(2)

They would have allowed early humans to cut meat with the cutting stone, and perhaps used the arrow head to hunt for food. The handaxe and hammer stone could be used to help early humans build shelters for survival.

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Examiner Comments

This response gives three possible mark points for hunting, cutting meat and the construction of shelters.

(ii) Suggest how these tools may have helped early humans to survive.

(2)

The tools would enable humans to kill prey more easily meaning they had more food to survive. They can also be used for other things such as self defence so to fight off anything which poses a risk to them.

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Examiner Comments

This was one worth one mark as fighting and hunting are both the same mark point as they are not sufficiently different uses.

Question 1 (b)

This question asked for an explanation as to why mitochondrial DNA is used rather than nuclear DNA as evidence for evolution. This question was well answered with many comparative statements given. The marks were awarded for the idea of higher abundance or easier to extract, less likely to decay or decompose, a high mutation rate or inheritance down the female line. Absolute statements like mitochondrial DNA has a high abundance or that it does not decay were not awarded credit and this was the main reason why marks were dropped. There were some misconceptions suggesting that mitochondrial DNA is only found in females rather than the idea of maternal inheritance.

(b) Mitochondrial DNA can be used as evidence for human evolution.

Explain why mitochondrial DNA is used rather than nuclear DNA.

(2)

Because nuclear DNA comes from both your mother and father, where as mitochondrial DNA is only inherited from your mother. Mitochondrial DNA is also far more abundant (common) than nuclear DNA, has a high mutation rate, and is less likely to degenerate over time. This means that there are more currently available to study.

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Examiner Comments

This response clearly explains the benefits of using mitochondrial DNA. The statements made in this response are comparative, for example, more abundant.

(b) Mitochondrial DNA can be used as evidence for human evolution.

Explain why mitochondrial DNA is used rather than nuclear DNA.

(2)

It's easier to extract and track evolution of DNA from fossils. There is also much more mitochondrial DNA available.

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Examiner Comments

This was only awarded one mark as the reason that mitochondrial DNA is easier to extract is that it is found in a higher abundance.

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Examiner Tip

Ensure your explanation has sufficient detail to match the number of marks available.

(b) Mitochondrial DNA can be used as evidence for human evolution.

Explain why mitochondrial DNA is used rather than nuclear DNA.

(2)

Mitochondrial DNA does not decay over time like nuclear DNA does and there are also more copies of mitochondrial DNA than nuclear DNA.

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Examiner Comments

This response was only awarded one mark because the statement mitochondrial DNA does not decay over time is incorrect.

Question 1 (c)

The question asked for a description of how fossil evidence can be used to show that humans have evolved. The marks were awarded for idea of changes in body structure or named structure changes, the idea of changes in complexity of tools and for referencing specific fossils. The question proved more challenging than the previous items of question one. The most frequent mark awarded was for named changes in body structure such as increasing skull size. Ardi and Lucy were commonly seen as named fossils. There were fewer references to the increasing complexity of tools. Increasing brain size was not awarded a mark unless linked to cranial capacity or skull size as it cannot be observed in a fossil.

(c) Describe how fossil evidence can be used to show that humans have evolved.

(2)

We can see from fossil evidence that as the nearer the age of fossil, the more human-like the fossils is, and can also tell we involved from a common ancestor.

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Examiner Comments

Statements on more human-like or human features are too vague to be awarded credit

(c) Describe how fossil evidence can be used to show that humans have evolved.

(2)

Because from different fossils from differ time periods you will be able to see changes that have happened to make them more adapted to their environmen

ResultsPlus
Examiner Comments

This response did not gain marks as changes was not specific enough to gain the mark on changes in body structure.

(c) Describe how fossil evidence can be used to show that humans have evolved.

(2)

Hominid fossils such as 'Ardi', 'Lucy' and 'the Turkana boy' show differences and changes in the bone structure of early humans showing things like an adaption to upright walking and an increasing brain size.

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Examiner Comments

This response achieved maximum marks because it refers to specific named fossil remains and clearly describes how they can show changes in bone structure.

Question 2 (a) (i)

This question asked for a description of a trend in the graph for one mark. The mark was given for identifying the increase in the number of cases from April to October and then a decrease to December. A surprising number of responses failed to obtain the mark and this was either because they identified the wrong month as the peak in the number of cases or that they gave a general description of an overall increase without the attention to detail.

(a) (i) Describe the trend shown in the graph from April to December.

(1)

Increases until it peaks in october then the number of cases start to decrease

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Examiner Comments

This was awarded the mark for identifying the increasing trend, peaking in October and then decreasing.

(a) (i) Describe the trend shown in the graph from April to December.

(1)

it goes up until october when it decreases.

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Examiner Comments

This response implies that the decrease in the number of cases occurs in October so was not awarded the mark.

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Examiner Tip

Ensure you include sufficient detail and accurate data when describing trends in graph.

Question 2 (a) (ii)

This calculation required the number of cases in September 2012 to be obtained by reading from the graph and then subtracting the number of cases given for September 2011 to calculate the difference. The scale on the graph had one small square as 40 cases and a higher than expected number of responses showed that the value from the graph was not correctly read from the scale. The straightforward subtraction calculation was correct in a very high proportion of answers. Two marks were awarded for the correct answer and one mark for reading the correct value from the graph.

(ii) In September 2011 there were 168 cases of whooping cough in the UK.

Calculate the difference in the number of cases of whooping cough in September 2011 and September 2012.

(2)

1320 - 168 = 1152

1152 cases

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Examiner Comments

This was awarded two marks for correctly calculating the value of 1152 by obtaining the number of cases in September 2012 and then subtracting 168.

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Examiner Tip

Always show your workings in calculation questions.

(ii) In September 2011 there were 168 cases of whooping cough in the UK.

Calculate the difference in the number of cases of whooping cough in September 2011 and September 2012.

(2)

1320−168 = 1153

1153 cases

ResultsPlus
Examiner Comments

This was awarded one mark for obtaining the value of 1320 from the graph. This is clearly shown in the working out despite the wrong answer being calculated.

Question 2 (b)

This question required the recall of the term exponential to describe the rapid growth of bacteria. This proved challenging to candidates across the ability spectrum. The most common incorrect responses were multiplication, cell division or mitosis, these describe how bacteria grow rapidly.

(b) Whooping cough is caused by the bacterium *Bordetella pertussis*, which grows rapidly in the human body.

State the term used to describe the rapid growth of a bacterial population.

(1)

Exponential growth

ResultsPlus
Examiner Comments

This was awarded the mark for exponential growth.

(b) Whooping cough is caused by the bacterium *Bordetella pertussis*, which grows rapidly in the human body.

State the term used to describe the rapid growth of a bacterial population.

(1)

rapid cell division.

ResultsPlus
Examiner Comments

This is incorrect as it is the reason why rapid growth occurs but is not the term used to describe the rapid growth.

Question 2 (c)

The responses to this question allowed the demonstration of a good level of scientific knowledge and understanding and also revealed some misconceptions. The question asked for suggestions as to why outbreaks of whooping cough still occur in the UK. The marks were awarded for suggesting that a lack of immunisation, the idea of immigration, the possibility that the immunisation can be ineffective or that bacteria can mutate and new strains arise and also that immunity decreases over time or that boosters are required. The most common responses given were the lack of immunisation and that immunisation is not always effective. The idea of bacteria mutating so that the antibodies produced by the body/ memory lymphocytes are ineffective demonstrates a good level of knowledge. However, marks were not awarded when responses incorrectly suggested the bacteria become resistant or immune to the immunisation. The idea that people can catch whooping cough from the immunisation is incorrect and was not awarded credit.

(c) Children in the UK can be immunised against whooping cough.

Suggest why outbreaks of whooping cough still occur in the UK.

(2)

Because adults haven't been immunised and there are different types of whooping cough (different strains of the bacteria) this means the children have been immunised against 1 kind but the other is still able to be caught.

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Examiner Comments

This was worth two marks for the idea of the lack of immunisation and the different strains of the bacteria meaning that immunised people are still susceptible to infection.

(c) Children in the UK can be immunised against whooping cough.

Suggest why outbreaks of whooping cough still occur in the UK.

(2)

- Not enough children have been immunised for herd immunity to occur.
- Some parents do not wish to have their child immunised due to the potential side-effects.

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Examiner Comments

This response is only worth one as the only suggestion for the outbreaks of whooping cough is a lack of immunisation.

Question 2 (d)

This question asked for a description of the human body's response to immunisation. The marks were awarded for the idea of the introduction of an antigen, named antigen or the stimulation of an immune response, the production of antibodies, by lymphocytes and the production of memory lymphocytes. A good level of scientific knowledge was demonstrated in this question with many responses obtaining maximum marks. Marks were lost when insufficient detail was included and key scientific terms were not used. The idea of injecting a weak version of the disease was insufficient for the first marking point as was white blood cells for marking point two and memory cells for marking point four.

(d) Describe the response of the human body to immunisation.

(3)

The immune system respond to the foreign cells (antigen) from the immunisation by activating a lymphocyte that is able to make antibodies that are specific for that antigen. That lymphocyte begins to divide and produce antibodies against that pathogen. Memory lymphocytes remain in the blood so the immune system can respond much quicker if the pathogen (antigen) ever re-enters the body.

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Examiner Comments

This response demonstrated excellent knowledge of the human body's response to immunisation. They have included the idea that the immune system responds to a foreign antigen, that lymphocytes make antibodies and that memory lymphocytes are produced.

(d) Describe the response of the human body to immunisation.

(3)

Immunisation ~~happens~~ is injecting the body with a dead or weakened form of a disease. The body is then able to identify the disease and get rid of it, so if the proper disease is caught the body can identify the disease and fight against it.

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Examiner Comments

The idea of injecting a weak version of the disease is insufficient for a mark. The remaining answer is too vague and does not describe the body's response.

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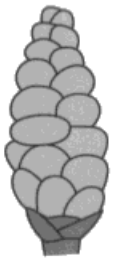
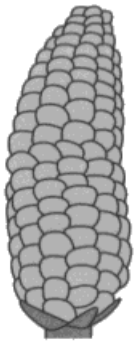
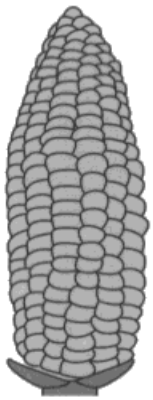
Examiner Tip

Ensure that key scientific terminology is used in your answers.

Question 3 (a)

This question asked candidates to describe how a plant breeding programme could be used to produce maize with larger cobs. The marks were given for the idea of selecting plants with desirable characteristics, the breeding of these together and the idea of selecting offspring and repeating the process over time. There was an alternative possibility of taking seeds from large cobs, planting these together and repeating this process over time. Many responses that described the selective breeding process achieved maximum marks, although some didn't complete their description by suggesting the process could be extended over time. There were a significant proportion of responses which showed the misconception that this could be achieved through genetic modification.

3 The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago → Present			

(a) Describe how scientists can use plant breeding programmes to produce maize plants with larger cobs.

(3)

Scientists can selectively breed to maize plants. They can take 2 plants with the ~~this~~ desired characteristics over & breed them (2 plants with large cobs) and their offspring will have even longer cobs. They can take their offspring and offspring of another and breed them so the maize will be even bigger. So over generations the selective breeding programme will produce maize plants with longer cobs.

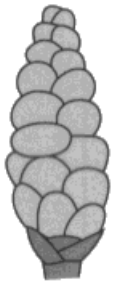
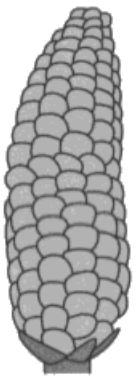
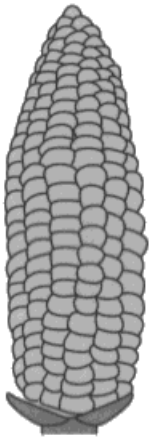
ResultsPlus

Examiner Comments

This response received maximum marks by describing the process of selecting plants with desirable characteristics and breeding them together and then repeating this with the offspring.

Food production

3 The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago →			Present

(a) Describe how scientists can use plant breeding programmes to produce maize plants with larger cobs.

(3)

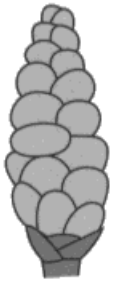
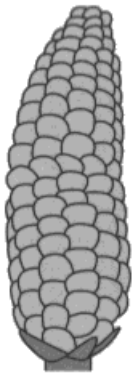
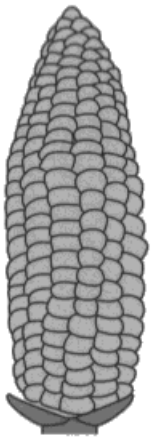
The use of selective breeding where they use maize with larger cobs to ~~breed~~ breed with other maize plants with larger cobs. This means that it will produce plants with larger cobs.

ResultsPlus
Examiner Comments

This response did not extend the answer to the idea of repeating the breeding over several generations.

Food production

3 The diagram shows the development of maize cobs over the last 1000 years of cultivation.

maize cobs				
mean mass of cob /g	15	45	70	90
date	1000 years ago →			Present

(a) Describe how scientists can use plant breeding programmes to produce maize plants with larger cobs.

(3)

Scientists can genetically modify maize to produce larger cobs. They select an organism that has a gene that enables to create the large cobs. They take this gene and insert it into a plasmid. The plasmid with required gene is put into a vector such as Agrobacterium. Maize cobs are the inpeated with Agrobacterium in a leaf disc. The plasmid becomes a part of plants DNA with required gene

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Examiner Comments

This response describes genetic engineering rather than a breeding programme.

Question 3 (b)

This question was very well answered with candidates successfully describing how pesticides could be used to benefit maize production. Pesticide is a very general term and as a result one possible linked explanation related to the idea of killing or detering pests, reducing the damge to crops and allowing an increased yield. The alternative idea that pesticides killed weeds which reduces the competition for resources and allows an increased yield was also credited.

(b) There has been an increase in the use of pesticides during the last 1000 years.

Explain how the use of pesticides may benefit maize production.

(2)

It reduces the amount of pests that kill or eat the maize, which will increase the yield as less of it is getting destroyed or eaten before it can be harvested.

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Examiner Comments
This response was awarded maximum marks for a complete explanation.

(b) There has been an increase in the use of pesticides during the last 1000 years.

Explain how the use of pesticides may benefit maize production.

(2)

pesticides deter predators that want to take the maize meaning the ~~mas~~ maize is left in ~~peace~~ peace to grow

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Examiner Comments
The idea that pesticides deter predators is incorrect and was not awarded credit.

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Examiner Tip
Ensure that scientific terminology is used correctly.

(b) There has been an increase in the use of pesticides during the last 1000 years.

Explain how the use of pesticides may benefit maize production.

(2)

The use of pesticides may benefit maize production as it will increase crop yield and allow a better growth rate in the plants.

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Examiner Comments

This response was only worth one mark as it did not give a full explanation as to how the use of pesticides leads to an increased yield.

(b) There has been an increase in the use of pesticides during the last 1000 years.

Explain how the use of pesticides may benefit maize production.

(2)

because pesticides are used to kill weeds so if there are no weed then the maize plant has no compition on water or nutrient so it can get the maxium water and nutrients and grow bigger.

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Examiner Comments

This response demonstrated the alternative explanation which was credited.

Question 3 (c)

This question asked for a discussion on the advantages and disadvantages of the use of biofuel. A maximum of two marks was awarded for advantages and two for disadvantages. As advantages were awarded for renewable, carbon neutral or a description of the removal of carbon dioxide during photosynthesis, less sulphur dioxide production and the decreased use of fossil fuels. Renewable and a description of carbon neutral were the most common responses given. A number of responses showed the misconception that biofuel does not release carbon dioxide. The disadvantages that were credited were decreased food production, use of land, reduced biodiversity and the idea that the growth of crops is weather dependent. The most common responses related to the idea of the use of farmland which decreases the space available for the production of food. Some responses just referred to crops rather than food crops which is not quite sufficient as biofuels can be produced from crops.

(c) Maize plants can be used in the production of biofuel.

Discuss the advantages and disadvantages of the use of biofuel.

(4)

Producing biofuels is good because the plants that are grown take in carbon dioxide from the atmosphere during photosynthesis. Also, biofuels are renewable and will not run out unlike fossil fuels which are limited.

The disadvantages are that growing crops for biofuels takes up land that could be used to grow crops for food. This means that food supply decreases.

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Examiner Comments

This response received maximum marks for a good discussion on the advantages and disadvantages of biofuel production.

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Examiner Tip

Consider how you layout your answer when asked to discuss a topic to ensure your answer is balanced to achieve maximum marks.

(c) Maize plants can be used in the production of biofuel.

Discuss the advantages and disadvantages of the use of biofuel.

(4)

Advantages of biofuel are that it's sustainable and it's clean (it produce safer and less waste products).
Disadvantages are the crops used ~~the~~ to make biofuel take up a lot of land and car ~~eg~~ engines need to be adapted before they can use biofuel.

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Examiner Comments

This response shows a lack of attention to details referring to biofuels being clean and not the specific reasons as to why they are considered a cleaner fuel. The idea of conversion of car engines relates to the switching to the use of biofuels and not the actual use of the fuels.

(c) Maize plants can be used in the production of biofuel.

Discuss the advantages and disadvantages of the use of biofuel.

(4)

Biofuel is a sustainable source which has a constant production and will not run out
It can be used without giving of harmful byproducts like greenhous gasses e.g. carbon dioxide.
However it is expensive to produce and extract from plants as you get little amounts from each seed.
The energy output from biofuel differs from the production of crude oils.

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This response shows the common misconception that biofuels do not release greenhouse gases.

Question 4 (a) (ii)

This question asked for an explanation of one disadvantage of using hormones to stimulate ovulation. There were two possible explanations which were credited. The first was for more than one egg being released leading to multiple pregnancies and the increased risk of complications for the mother or babies. Alternatively there was the idea of the hormones inducing side effects in the mother which leads to the withdrawal of treatment. Candidates who explained the release of more than one egg often achieved maximum marks. Those who described the induction of side effects were usually only awarded one mark as they failed to explain it. The most common incorrect response was the idea that it interferes with the menstrual cycle which is not a disadvantage.

(ii) Infertility treatments, including the use of hormones, can stimulate ovulation.

Explain **one** disadvantage of treating infertility by using hormones to stimulate ovulation.

(2)

It can cause multiple eggs to be released and then fertiled leading to multiple pregnancies ~~whical~~ which can be dangerous for the mother and baby.

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Examiner Comments

This was awarded maximum marks for the release of more than one egg leading to multiple pregnancies which can be dangerous for mother and baby.

(ii) Infertility treatments, including the use of hormones, can stimulate ovulation.

Explain **one** disadvantage of treating infertility by using hormones to stimulate ovulation.

(2)

These hormones can have negative side effects such as abdominal pain and nausea.

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This response was awarded one mark for the idea of side effects.

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Examiner Tip

Consider the command word carefully before starting your answer.

Question 4 (b) (i)

This question proved challenging for some candidates and highlighted some misconceptions. The explanation behind the use of monoclonal antibodies in pregnancy test involved the monoclonal antibodies with coloured beads attached to them binding to a pregnancy hormone found in the urine. These then move up the test strip and immobilised antibodies bind the hormone leading to the accumulation of the coloured beads at the test window. Many responses recognised the test was on urine although slang words to describe urine were not accepted. Many responses also had the idea of the monoclonal antibodies binding a hormone. Many responses then described the binding of the hormone causing a colour change which was not sufficient to describe the accumulation of colour. The idea that the antibodies are attached to coloured beads was seen but there were some responses which indicated that the beads bind to the hormone. Some candidates described the production of monoclonal antibodies which did not answer the question.

(b) Monoclonal antibody technology is used in pregnancy tests and in the treatment of cancer.

(i) Explain how monoclonal antibodies are used to test for pregnancy.

(3)

Monoclonal antibodies are large quantities of identical antibodies produced from hybridoma cells. Because antibodies are very specific, they can be used to identify substances. Monoclonal antibodies are on pregnancy test sticks. A woman ~~p~~ urinates on the stick. If a hormone, HCG, which is found in pregnant women's urine, is detected, the monoclonal antibodies bind to it, causing a ~~colour~~ colour change. This indicates that the woman is pregnant.

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Examiner Comments

This response was awarded the marks for the antibody binding the hormone and that the hormone is in the urine.

(b) Monoclonal antibody technology is used in pregnancy tests and in the treatment of cancer.

(i) Explain how monoclonal antibodies are used to test for pregnancy.

(3)

There is a hormone which is only found in the urine of women who are pregnant. The antibody to this hormone is bound to blue beads and placed on the part of the strip you wee on. The part that shows you whether you are pregnant has more anti bodies to the hormone stuck down to the test strip. When you urinate on the strip the hormone binds to the antibody attached to the blue beads and washes them down the test strip. The hormone also binds to the antibodies stuck down to the test strip meaning the blue beads are now stuck to the strip. This how we know if you are pregnant.

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Examiner Comments

This is a good response explaining that the blue beads are bound to the monoclonal antibodies which bind the hormone in the urine. They then give details of the monoclonal antibodies moving up the strip to the antibodies which are stuck down.

(b) Monoclonal antibody technology is used in pregnancy tests and in the treatment of cancer.

(i) Explain how monoclonal antibodies are used to test for pregnancy.

(3)

The antibodies for a hormone - (found only in pregnant women's pee) are placed on the part of the stick that's urinated on with blue beads attatched. The test strip has these same antibodies stuck to it. When the stick is urinated on, if the woman is pregnant, then the hormone will bind to the antibodies with the blue beads. The urine then moves up the stick, carrying the hormone and the beads with it. The test strip will turn blue, because the antibodies that are stuck down will bind to the hormones with the blue beads.

ResultsPlus
Examiner Comments

This response is another example which demonstrates a good level of knowledge and understanding.

Question 4 (b) (ii)

This question asked for an explanation of the benefits of using monoclonal antibodies to treat cancer. The marks were awarded for the drugs being attached to the monoclonal antibodies, meaning less drug is used, that only cancer cells are targeted or healthy cells not affected and the reduction in side effects. Additionally a mark was awarded for referring to tumour markers or cancer antigens. There were a number of misconceptions in responses. Some candidates thought that the monoclonal antibodies attack the cancer cells or that drugs or radiation are not required. A high proportion of answers only gained one mark by explaining that only the cancer cells are targeted and giving the reverse argument that healthy cells are not affected. Some references to reduced side effects were seen with no hair loss being the most common side effect mentioned. Some candidates did state that there are no side effects which was not credited. Few responses referred to the idea of the drugs being attached to the antibody or that less drug is used.

(ii) The use of monoclonal antibodies to treat cancer has advantages over the use of traditional chemotherapy and radiotherapy.

Explain the benefits of using monoclonal antibodies to treat cancer.

(2)

Monoclonal antibodies can be attached to an anti-cancer drug. These antibodies can be such that they only bind with tumor cells' antigens- 'tumor markers'. This means that the drug only targets and kills the cancer cells, not the surrounding 'good' body cells (when lots of body cells are killed, the patient feels extreme pain). Using monoclonal antibodies means less cells are killed that aren't cancer cells.

ResultsPlus

Examiner Comments

This is a good example showing a detailed understanding. The monoclonal antibodies attach to anti-cancer drugs, bind tumour markers and only attacking cancer cells or not targeting healthy cells.

(ii) The use of monoclonal antibodies to treat cancer has advantages over the use of traditional chemotherapy and radiotherapy.

Explain the benefits of using monoclonal antibodies to treat cancer.

(2)

Cancer cells have particular markers on them which other cells do not. The ~~anti~~ antibodies only attach to these cell and only affect these cells unlike chemotherapy & radiotherapy which will damage all cells

ResultsPlus
Examiner Comments

This response does not have enough detail for the tumour markers/cancer antigens mark to be awarded.

(ii) The use of monoclonal antibodies to treat cancer has advantages over the use of traditional chemotherapy and radiotherapy.

Explain the benefits of using monoclonal antibodies to treat cancer.

(2)

They are attatched to drugs and then only affect the cancerous cells as the monoclonal antibodies only attatch to the cancerous cells. This ~~meaning~~ means that healthy cells are not affected and less of the drug is wasted.

ResultsPlus
Examiner Comments

This response illustrates three marking points. The monoclonal antibodies being attached to drugs, attaching to cancerous cells only and less of the drug.

Question 4 (b) (iii)

This question required candidates to recall that the cells which produce monoclonal antibodies are called hybridomas. This proved to be a difficult question. The most common incorrect response was the idea that lymphocytes or myelomas produce the monoclonal antibodies.

(iii) Name the type of cell that produces the monoclonal antibodies used to treat cancer.

(1)

hybridoma

(Total for Question 4 = 10 marks)

ResultsPlus
Examiner Comments

The mark was awarded for hybridoma.

ResultsPlus
Examiner Tip

Make sure that you learn the correct scientific terminology.

(iii) Name the type of cell that produces the monoclonal antibodies used to treat cancer.

(1)

B lymphocytes

ResultsPlus
Examiner Comments

This was a common incorrect response.

Question 5 (a) (i)

This was a straightforward mathematical question which asked for a mean to be calculated. Most candidates achieved this and were awarded maximum marks. The most common error was to add the four values up to 16.4 but fail to divide the answer by 4.

Body systems

5 People with diabetes insipidus are unable to produce enough of the hormone ADH.

In a medical study, the ADH levels in the blood of eight people were measured.

Four of the people, A, B, C and D, do not have diabetes insipidus.

The other four people, E, F, G and H, have diabetes insipidus.

The results are shown in the tables.

people without diabetes insipidus	ADH level in blood / µg per dm^3
A	5.2
B	2.8
C	4.9
D	3.5
Mean ADH level:	

people with diabetes insipidus	ADH level in blood / µg per dm^3
E	0.1
F	0.2
G	0.1
H	0.0
Mean ADH level:	0.1

(a) (i) Calculate the mean ADH level in the people without diabetes insipidus.

(5.2 + 2.8 + 4.9 + 3.5) ÷ 4 = 4.1 (2)

4.1 µg per dm^3

ResultsPlus
Examiner Comments

This response clearly shows the working and the correct answer has been calculated.

5 People with diabetes insipidus are unable to produce enough of the hormone ADH.

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F	0.2
G	0.1
H	0.0
Mean ADH level:	0.1

(a) (i) Calculate the mean ADH level in the people without diabetes insipidus.

(2)

$\frac{5.2 + 2.8 + 4.9 + 3.5}{5}$

$= \frac{16.4}{5}$

$= 3.28$

3.28 µg per dm³

ResultsPlus
Examiner Comments

This answer scored one mark for correctly totalling 16.4 despite the incorrect answer being calculated.

ResultsPlus
Examiner Tip

Always show your working.

Question 5 (a) (ii)

This question asked for possible reasons why people without diabetes insipidus have a range of ADH levels in their body. The marks were awarded for the idea of different hydration levels which included the influence of diet and exercise, natural variation, influence of drugs or salt intake. The majority of responses referred to the hydration levels of the body. There were very few references to salt or drug intake. Some candidates had confused this type of diabetes with type 1 or 2 diabetes.

(ii) Suggest why there is a wide range of ADH levels in the people without diabetes insipidus.

(2)

Because of natural variation - peoples bodies may produce different amounts of ADH ~~norma~~ reacting to ~~the~~ a similar stimulus. Also, ~~some~~ there would be different amounts of water drank by each person, so varying ADH needs at the time.

ResultsPlus
Examiner Comments

This response scored maximum marks for the natural variation in people's bodies and the difference in hydration level due to the consumption of water.

(ii) Suggest why there is a wide range of ADH levels in the people without diabetes insipidus.

(2)

Because the level of ADH released by the pituitary gland is in response to water content in the body. These people are likely to have different levels of water in their body therefore requiring different levels of ADH.

ResultsPlus
Examiner Comments

This response has only one suggestion for the different ADH levels - different water levels in the body.

(ii) Suggest why there is a wide range of ADH levels in the people without diabetes insipidus.

(2)

Some of the people may not drink enough water so have high ADH levels e.g person A. Others may be overhydrated. Some people may be influenced by drugs like ectasy and alcohol which influenees their ADH levels. Therefore, different lifestyles cause ADH levels between people to vary so much

ResultsPlus
Examiner Comments

This response has the idea of hydration level as well as the possible influence of drugs.

Question 5 (a) (iv)

This question required candidates to suggest possible symptoms experienced by patients with diabetes insipidus. The mark was awarded for dehydration, thirst, tiredness and increased volume of urine, common symptoms associated wih dehydration were also credited. Some vague responses referred to the idea that people need to go to the toilet more often and this was not awarded credit.

(iv) Suggest a symptom of diabetes insipidus.

(1)

Diabetes dehydration

ResultsPlus
Examiner Comments
This was the most common answer given as it is a symptom of low ADH levels.

(iv) Suggest a symptom of diabetes insipidus.

(1)

pituitary gland does not work efficiently releases less ADH.

ResultsPlus
Examiner Comments
This is not a symptom and therefore did not gain the mark.

Question 5 (b)

The first six mark question which assess the quality of written communication was on the regulation of the water content of the blood by ADH. To gain mark band one candidates needed a simple explanation on the increase or decrease in water content of the blood. For mark band two a detailed explanation of either the increase or the decrease in water content of the blood or a detailed explanation of one was required. To gain mark band three the explanation needed to be detailed for both the increase and decrease in water content of the blood and include details on how ADH affects the permeability of the collecting duct, kidney tubules or nephron. Many responses were restricted to mark band 2 due to a lack of detail referring to an increase or decrease in the absorption of water by the kidney. Responses that did achieve mark band three demonstrated a very high level of knowledge and understanding of the topic. There were very few examples of response which got the response to hydration levels the wrong way round.

*(b) Explain the role of ADH in regulating the water content of the blood.

(6)

Water levels are monitored by the hypothalamus of the brain. If levels of water are too low, the brain will trigger the pituitary gland to release more ADH. This hormone travels into the kidney, effecting the nephrons. The hormone makes the nephron more permeable so more water is reabsorbed into the blood from the nephron. As a result, less water is excreted in urine and more stays in the body, helping keep water levels at a healthy level. As a result of more water being reabsorbed there is less volume of urine but at less a higher concentration of urea.

If water levels in the blood are too high, ADH is stopped being released. This means less water is reabsorbed and more water collects in the bladder and is excreted in as urine. As a result, less water is reabsorbed meaning more water leaves the body helping to lower water content of the blood. The whole process is controlled by negative feedback, keeping water level in a healthy, normal range.

(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

This was a good mark band 3 response which explains the increase and decrease in the water content of the blood which includes detail on the relative permeability of the nephron which was sufficient.

*(b) Explain the role of ADH in regulating the water content of the blood.

(6)

ADH (anti-diuretic hormone) is an example of negative feedback in the body. If there is not enough water in the blood, this is detected by the hypothalamus which stimulates the pituitary gland to release more ADH. The ADH works on the nephrons in the kidney to make more water be reabsorbed back into the bloodstream, returning the blood water levels to normal. If there is too much water in the blood, the pituitary gland is stimulated to release less ADH, so less water is reabsorbed back into the bloodstream, making urine more dilute.

ResultsPlus
Examiner Comments

This was a clear mark band 2 answer with an explanation for the increase and decrease in water reabsorption. The answer lacks the detail on the relative permeability of the collecting duct or nephron which would be needed for mark band 3.

ResultsPlus
Examiner Tip

Try to extend your answers to include the maximum amount of detail.

Question 6 (a) (ii)

This question asked for an explanation as to why a man with high cholesterol has been advised to eat mycoprotein instead of meat. The marks were awarded for the idea of decreasing the man's cholesterol levels or that his cholesterol exceeded the recommended level, that mycoprotein has less cholesterol or fat and that it reduces the change of a heart attack, stroke or another named condition. The idea of mycoprotein containing no cholesterol was credited but not that it contains no fat. Heart disease is too vague for the third mark it has to be a heart attack, stroke or another named condition. The question was well answered by candidates of all abilities.

(ii) The government recommends that the total cholesterol level in the blood for adults should be 5 mmol per dm^3.

Explain why this man has been advised to eat mycoprotein rather than meat.

(2)

Mycoproteins contain all the proteins and good bacteria as meat but ~~no~~ much lower levels of fat and calories. Meat is higher in cholesterol than mycoproteins.

ResultsPlus
Examiner Comments

This response does not fully explain why the man has been advised to eat mycoprotein rather than meat and was only awarded one mark.

(ii) The government recommends that the total cholesterol level in the blood for adults should be 5 mmol per dm^3.

Explain why this man has been advised to eat mycoprotein rather than meat.

(2)

Mycoprotein contains less cholesterol than meat. This is an advantage/benefit because high cholesterol levels have been closely linked to health issues i.e. heart disease. Therefore by eating mycoprotein rather than meat, this man will have a lower cholesterol level - and thus be healthier because he is less likely to suffer from health problems i.e. heart disease.

ResultsPlus
Examiner Comments

This response scored two marks for the idea of less cholesterol and the lowering of the man's cholesterol. Heart disease would not have been awarded credit because it is too vague.

Question 6 (b)

This question asked for a description of how mycoprotein is produced. There were some very good responses to this question. The marks were awarded for the use of a fermenter, *Fusarium*, a named reagent supplied to the fermenter, maintaining optimal conditions or aseptic conditions or lack of stirring and finally the idea that the fungus has to be processed to produce mycoprotein. If the *Fusarium* was referred to as a bacteria this marking point was not awarded. Many good responses covered more than three marking points. Details were required for the reagent supplied to the fermenter, air and nutrients are too vague. Many good responses explained why the fermenter is not a stirrer and some even described how a convection current can be created to mix the mycoprotein.

(b) Describe how mycoprotein is produced.

(3)

Mycoprotein is produced from a fungus called fusarium. It is produced in a fermenter where it is provided with glucose, air or oxygen, amonia or nitrogen, and agitation in the form of a convection current. It forms strings call hyphae which are extracted from the fermenter and then shaped and flavoured.

ResultsPlus

Examiner Comments

This response shows a high level of knowledge and understanding on the production of mycoprotein hitting more than the required three marking points.

(b) Describe how mycoprotein is produced.

(3)

Mycoprotein is the large scale growth of the bacteria Fusarium. The bacteria is grown in a fermenter and ~~it then~~ it then has other ingridients added to it and possibly flavourings.

ResultsPlus
Examiner Comments

This response was not awarded the mark for Fusarium because they refer to it as a bacteria.

Question 6 (c)

This question proved to be challenging to many candidates. It required candidates to interpret data from a graph and relate this to the production of yogurt by micro organisms. Mark band one was awarded for a simple description of the data or yogurt production. Mark band two was awarded for linking the data trends to some interpretation of why the trends occur or a detailed descripition of the production of yogurt. For example, the pH at 60°C does not decrease because the micro organisms have died or the enzymes have denatured. To get mark band three the candidates need to relate the data trends to the interpretation and the production of yogurt, specifically they needed to explain that the decrease in pH is due to the production of lactic acid. Many candidates did not obtain mark band three as they did not explain why the pH decreased but were awarded mark band two by interpreting some of the data and relating it to the optimal growth conditions for the growth of micro organisms. The most common error which was made was to link the idea that at 60°C the pH is maintained at a constant level with the idea that this must be the optimal conditions for the production of yogurt.

Using the information in the graph, explain how temperature affects the fermentation process during yogurt production.

(6)

The microorganisms ferment milk by turning lactose in lactic acid, which produces yoghurt, but also lowers the pH of the microorganisms' environment. They do this using enzymes inside the organisms, so temperature affects the rate of ~~reaction~~ reaction because more heat energy means more collisions between molecules, so more enzymes react with the lactose with higher temperature This is why, at 20°c, the rate of reaction is slower than that of the reaction at 40°c - 20°c drops pH to 4.5 in 9 hours, but 40°c only takes 6 hours. Because lactic acid is the product of the reaction, the lower the pH means more acid has been produced, implying a high rate of reaction between lactose and enzymes. However too high a temperature denatures the enzymes and they will no longer react with the lactose due to a deformation of their active sites. This is why, at 60°c, the rate of reaction is much slower than the other two temperatures. 60°c is apparently too high a temperature for the microorgan enzymes so the fermentation process does not occur at all.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
Examiner Comments

This response is worth mark band three as it links the data trends with the interpretation for the growth of micro organisms and that the production of yogurt involves a decrease in ph due to the production of lactic acid.

Using the information in the graph, explain how temperature affects the fermentation process during yogurt production.

(6)

This graph shows us that the temperature of the starter culter, affects the reaction time of the product. At 60°C the reaction is a lot ~~sta~~ slower than it was at 20°C. This is because the enzymes become too hot and become denatured. This means they have lost their shape and now won't be able to speed up the reaction. However at 40°C the reaction happen faster than it did at 20°C as 40°C is optimum temperature. It is the highst temperature at which the enzymes don't become denatured. A high temperature is useful as it gives the enzymes a lot of energy to speed the reaction up even faster.

ResultsPlus

Examiner Comments

This response links the data trends with some interpretations on the conditions required for the growth of micro organisms and was awarded mark band 2.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure they read graph scales accurately when extracting information from the graph.
- Always show the working when doing calculations as a mark can be awarded for errors carried forward in this case.
- Check the number of marks given for the question and ensure that they have included enough facts to match the mark awarded.
- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given.
- Ensure that they include sufficient detail for both parts of an answer when asked to discuss the advantages and disadvantages of a process or concept.
- Use scientific terminology accurately where possible in responses.
- Try to include scientific knowledge in their response when asked to explain data shown in a graph rather than just providing a description of the data.
- Use all the information given in the question to help them construct their answer but avoid just repeating the information which has already been given.
- Avoid vague answers which will not gain credit and candidates should ensure their answer includes a good level of scientific detail.
- Think about the structure of the answer before starting to write when tackling the extended answers to ensure that the answer shows clarity of writing and flows, while remembering that accurate spelling and grammar in these questions is also important.
- Read the questions carefully and check answers include enough detail.

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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