Pearson
Edexcel

Examiners' Report
June 2018

GCE Biology B 8BI0 01

ResultsPlus

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.

ResultsPlus

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 2018
Publications Code 8BI0_01_1806_ER

All the material in this publication is copyright
© Pearson Education Ltd 2018

Introduction

This was the third sitting of the AS paper 8BI0/01: Core Cellular Biology and Microbiology designed to assess Biological Molecules, Cells, Viruses and Reproduction of Living Things.

Almost every mark on the paper was achieved and almost all questions achieved a full range of the marks available.

The level of demand remained significantly higher than previous specification AS papers with far fewer 'easy' marks and it remains significantly more demanding to achieve full marks for the longer questions and many of the shorter explain questions because of the requirement for candidates to answer the whole question to gain full marks.This accompanies the greater requirement to apply knowledge and understanding in the context of qualitative and quantitative data provided.With many questions it is only a handful of candidates who manage to achieve full marks.In comparison to 2017 the paper appears to be more accessible with most questions achieving a good spread of marks and a higher overall mean mark.

Questions that demanded recall tended to score well e.g. when asked to describe what is meant by the secondary structure of a protein or identify the sequence of diagrams involved in the first division of meiosis.

Many candidates did well with the questions testing their understanding and ability to apply mathematical skills.Unfortunately there are still a significant number of candidates who struggled with the calculation questions and many were left blank.

Many candidates lost marks through not reading the question carefully e.g. describing the process of oogenesis rather than describing how the products of oogenesis differ from the products of spermatogenesis in mammals.

It was disappointing that a significant number of candidates struggled with questions relating to practical work and techniques.

Multiple Choice Questions:

Q2ai

Most candidates thought that the correct answer was C as this is the shape of graph they most commonly associate with enzyme reactions.This ignored the context of the question and in particular the axis label "Time taken"

Q2aii

Most candidates were able to identify the decrease in the activation energy.Others identified went for X +Y or Z as their response.

Q4bi

Just under half of candidates managed to identify which was diploid and which was haploid.This could be due to not knowing the terms involved in the question or being unable to interpret the diagram.

Q4bii

The majority of candidates (over 60%) were able to identify where meiosis occurs in each life cycle.

Q6ai

The vast majority of candidates recognised the rough endoplasmic reticulum correctly.

Q6aii

Most candidates recognised that prokaryotes also have a cell surface membrane, although some thought they have mitochondria.

Q7a

The majority of candidates managed to identify the correct reactions using the information provided.The most common error seen was thinking that amylose would be a reducing sugar.

Successful candidates:

- answered questions in the context set;
- were able to analyse rather than just describe the data provided;
- provided specific, relevant details to their answers;
- attempted every question;
- worked through calculations in a logical sequence, showing their working;
- demonstrated the ability to convert units and orders of magnitude.

Question 1 (a) (ii)

Q1ai

Nearly all candidates were able to identify the correct sequence of diagrams for the first division of meiosis.

Q1aii

The majority of candidates were able to identify both the nuclear envelope and the centromere.The most common errors included chiasmata and cell surface membrane.

This response scored one of the two available marks.

(ii) Identify the parts labelled P and Q.

(2)

P cell membrane

Q centromere

ResultsPlus
Examiner Comments

This is an example of one of the common errors mistaking the nuclear envelope with the cell membrane.

This response scored one of the two available marks.

(ii) Identify the parts labelled P and Q.

(2)

P Nuclear membrane

Q Chiasmata

ResultsPlus
Examiner Comments

This is another common mistake where the centromere is mistaken for chiasmata.

This response gained no marks.

(ii) Identify the parts labelled P and Q.

(2)

P Spindle fibre

Q Chiasmata

ResultsPlus
Examiner Comments

This illustrates another error seen where the nuclear envelope was thought to be a spindle fibre.

This response scored both of the available marks.

(ii) Identify the parts labelled P and Q.

(2)

P Nuclear envelope

Q Centromere

ResultsPlus
Examiner Comments

An example of the many correct responses seen.

Question 1 (b)

The majority of answers clearly recognised that one difference in the products of oogenesis and spermatogenesis is that oogenesis produces polar bodies. Many answers did not go beyond this as they described the difference in the processes and not the products made. Highly scoring answers sometimes made use of the phrase/aide memoir "sperm are many, mini and motile", sometimes with "eggs are few, fat and fixed".

This response scored one of the four available marks.

(b) In mammals, meiosis occurs during oogenesis and spermatogenesis.

Describe how the products of oogenesis differ from the products of spermatogenesis in mammals.

Spermatogenesis = 4 spermatozoa formed

Oogenesis = one haploid ovum and 3 polar

(4)

Spermatogenesis forms 4 haploid spermatids, which differentiate into 4 haploid spermatozoa. However, oogenesis forms a secondary oocyte and a polar body after the first meiotic division and the second meiotic division is only completed at fertilisation to form a haploid ovum and 3 polar bodies which degenerate and die.

ResultsPlus
Examiner Comments

This is an example of the many responses seen that only make one clear comparative point between the products i.e. oogenesis produces polar bodies.

This reponse gained three of the four available marks.

(b) In mammals, meiosis occurs during oogenesis and spermatogenesis.

Describe how the products of oogenesis differ from the products of spermatogenesis in mammals.

(4)

The products of oogenisis are ~~an~~ an ovum (egg) it is bigger than the product of spermatogenisis which is a sperm. Sperm are created at puberty in boys and eggs are produced from birth in guns. Eggs are larger than sperm, there are a limited supply. ~~Sperm~~ There are millions of sperms produced and they are small and motile.

ResultsPlus
Examiner Comments

Marks were awarded for ovum being bigger; millions of sperm produced and sperm are motile.

ResultsPlus
Examiner Tip

In the context of this question clear statements about sperm or ova were accepted e.g. sperm are motile. However, if asked for differences you should aim to make a clear comparison making reference to both products e.g. here an ovum is bigger than a sperm.

This response gained all four marks available.

(b) In mammals, meiosis occurs during oogenesis and spermatogenesis.

Describe how the products of oogenesis differ from the products of spermatogenesis in mammals.

(4)

Ova is the product of oogenesis. It is very fat and fixed in its place because it needs to have nutrients so when it fertilises by sperm the fertilised cell can have it as a food. oogenesis only produces few ovas where as spermatogenesis produces a lot of sperms since they have to compete with other others and needs to go through different PH and temperatures into order to fertilise an egg cell. So sperms are many, more and motile. sperms have mitochondria to help the to the flagellum to move and have an acrosome region where it has digestive enzymes in order to penetrate and digest the zona pellucida layer. Egg cell also have enzymes that it releases when one sperm comes in contact with the zona pellucida layer.

(Total for Question 1 = 7 marks)

ResultsPlus
Examiner Comments

This is an example where the useful phrase sperm are many and motile and Ova are fat and fixed helps. They have recognised why an ovum is bigger, that sperm have flaggella and an acrosome, ova are surrounded by the zona pellucida and many more sperm are produced.

ResultsPlus
Examiner Tip

Aide memoirs can help revision and recall, particularly if you can use them to recall specific details as shown in this response.

This response gained no marks.

(b) In mammals, meiosis occurs during oogenesis and spermatogenesis.

Describe how the products of oogenesis differ from the products of spermatogenesis in mammals.

(4)

The products of oogenesis differ from the products of spermatogenesis as oogenesis produces ova (eggs) and spermatogenesis produces sperm.
Also, in oogenesis

ResultsPlus
Examiner Comments

Although what is said in this reponse is true the question did not ask them to name the products but to describe the differences in the products.

ResultsPlus
Examiner Tip

Read the question carefully and include AS level details in your response.

Question 2 (b) (i)

Most candidates were able to describe the difference between Gram positive and Gram negative bacteria. Most answers tended to concentrate on why bacteria respond differently to the same antibiotic. Few considered different antibiotics and we didn't see many suggestions about how antibiotics work.

This response gained all three marks available.

(b) Some antibiotics affect the enzymes involved in the growth of bacteria.

(i) Explain why Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

(3)

Gram positive bacteria have cell walls made of peptidoglycan while Gram negative have cell walls made of lipopolysaccride. this means that Gram positive has thicker cell walls than Gram negative as peptidoglycan is rigid. So some antibiotics are not strong enough to penetrate the hard peptidoglycan layer but can penetrate the soft lipopolysaccride layers. also some antibiotics such as penecifin can inhibit the peptidoglycan layer but not the gram negative meaning its effects only gram positive [illegible]

ResultsPlus
Examiner Comments

Credit was given here for comparing the bacteria and explaining why some antibiotics would affect gram positive and some would affect gram negative bacteria.

This response scored two of the three available marks.

(b) Some antibiotics affect the enzymes involved in the growth of bacteria.

(i) Explain why Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

(3)

Gram-positive bacteria has a thick peptidoglycan layer therefore most of the antibiotics target the enzymes envolved in the formation of the peptidoglycan layer. the Gram-negative bacteria a have a thin layer of peptidoglycan between two phospholipid layers therefore it won't have much effect, also they have a liposaccharide layer which masks their identity and makes it harder to indentify which antibiotic should be used.

ResultsPlus
Examiner Comments

Credit was given for identifying the difference between the two types of bacteria and explaining that antibiotics could target the enzymes involved in the formation of the peptidoglycan layer.

This response gained no marks.

(b) Some antibiotics affect the enzymes involved in the growth of bacteria.

(i) Explain why Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

(3)

Because gram positive bacteria has a thinner cell surface membrane than Gram negative, therefore antibiotics could get in easier. Also gram positive is has 70s ribosomes whereas gram negative has 80s ribosomes which would react differently to antibiotics.

ResultsPlus
Examiner Comments

Several misconceptions are shown by this response.

This response scored one of the three available marks.

(b) Some antibiotics affect the enzymes involved in the growth of bacteria.

(i) Explain why Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

(3)

Gram positive bacteria has a thick layer of peptidoglycan in its cell wall so these bacteria are usually easier to treat with antibiotics as the antibiotics that target the peptidoglycan layer can be used.
Whereas gram negative bacteria has a very thin peptidoglycan layer so is not effected by these antibiotics.

ResultsPlus
Examiner Comments

This example is typical of the many that recognised the difference between the bacteria. Targetting the peptidoglycan is not clear enough for the action of the antibiotic.

This response scored none of the available marks.

(b) Some antibiotics affect the enzymes involved in the growth of bacteria.

(i) Explain why Gram positive bacteria and Gram negative bacteria react differently to some antibiotics.

(3)

Gram positive and gram negative bacteria react differently to some antibiotics due to their structure. Gram negative bacteria do not have an outer wall, so antibiotics which affect this will not have an effect on them, ~~Antibio~~ whereas they will affect gram positive bacteria, which do have this outer wall. Antibiotics affecting the

ResultsPlus
Examiner Comments

This is an example of a response that did not fully describe the differences in the structures or explain the antibiotics.

Question 2 (b) (ii)

Many candidates recognised that viruses are not living or are not cells, but few candidates explained why an antibiotic would not work on them. A lot of candidates described the need to use antiviral drugs and how they work. Other responses included descriptions of where a virus might be i.e. inside a cell so antibiotics can't get to it.

This response scored one of the two available marks.

(ii) Explain why viruses are not affected by antibiotics. **(2)**

Viruses are within are cells and are not living so antibiotics cannot fight against them and it is difficult to stop them without damaging the cell.

ResultsPlus
Examiner Comments

This gained a mark for recognising that viruses are not living.

This response gained both marks available.

(ii) Explain why viruses are not affected by antibiotics. **(2)**

Viruses do not have their ~~DNA~~ peptidoglycan cell wall nor ribosomes. ~~It is non-living~~ They rely on other cells for replication so they won't be affected as they are non-living.

ResultsPlus
Examiner Comments

Credit was given to this response for recognising that viruses are non-living and they don't have a cell wall or ribosomes - both of which could be targets for the antibiotics.

This response gained no marks.

(ii) Explain why viruses are not affected by antibiotics.

(2)

Viruses are inside body cells and antibiotics don't attack body cells therefore they don't attack viruses

ResultsPlus
Examiner Comments

This is typical of the many responses that reasoned that the viruses are protected because they are inside other cells.

This response gained no marks.

(ii) Explain why viruses are not affected by antibiotics.

(2)

Viruses continously change shape and form so there is no specific antibiotic that can affect it. Viruses are also protected by a protein coat.

ResultsPlus
Examiner Comments

Many candidates thought that antibiotics do not work on viruses because they change so much - perhaps due to some confusuion between the action of antibodies and antibiotics?

Question 3 (a)

Many candidates recognised or described water as a polar solvent. Few described the tertiary structure of a globular protein or the nature of the R groups that would enable it to form hydrogen bonds with the water. Several candidates described why it needs to be soluble (so it can be transported in the blood) rather than how it is soluble.Others described the bonding within the protein and suggested that it is easily digested because of the weak hydrogen bonds within the protein. A few candidates described a phospholipid rather than a globular protein.

This response scored one of the three available marks.

3 Leeches are parasites that feed by sucking blood. When they bite, they secrete saliva into the wound. The saliva contains a globular protein called hirudin.

(a) Explain why this protein is soluble in water.

(3)

Water is a polar solvent, made up of hydrogen bonds due to the partial charges of its molecules. This makes it a universal solvent so lots of substances can dissolve in it.

Proteins are enzymes made up of amino acids, that are formed from DNA. Amino acids are made up of ~~nitrogen~~ hydrogen, ~~and~~ which is why it can dissolve in water.

ResultsPlus
Examiner Comments

The only point of credit here was for recognising that water is a polar solvent.

This response is worth no marks.

3 Leeches are parasites that feed by sucking blood. When they bite, they secrete saliva into the wound. The saliva contains a globular protein called hirudin.

(a) Explain why this protein is soluble in water.

- territary structure
- globular proteins are hydrophillic

(3)

" the protein would be soluble because it ~~is made~~ has a territary structure

" the hydrogen bonds would be between prosetic group

" globular proteins are usally made up of hydrophillic phospholipids which is what makes it soluble in water

ResultsPlus
Examiner Comments

This is an example of a response that looks at the tertiary structure of the protein and confusion with phospholipids.

This response scored two of the three available marks.

3 Leeches are parasites that feed by sucking blood. When they bite, they secrete saliva into the wound. The saliva contains a globular protein called hirudin.

(a) Explain why this protein is soluble in water.

(3)

The protein are made from ~~contains~~ amino acids monomers which have various R groups attached to the alpha carbon. The R groups that are hydrophobic would be oriented towards the centre, away from water where as the hydrophilic R groups would be oriented outwards, facing the external environment. The hydrophilic R groups interact with the water molecules causing the protein to be soluble in water.

ResultsPlus
Examiner Comments

Credit was given here for the orientation of the folding and the hydrophilic R groups.

ResultsPlus
Examiner Tip

At AS be as specific as possible e.g. here 'interact with the water' is not clear enough for credit.

This reponse gained all three marks available.

3 Leeches are parasites that feed by sucking blood. When they bite, they secrete saliva into the wound. The saliva contains a globular protein called hirudin.

(a) Explain why this protein is soluble in water.

(3)

Globular proteins have a complex tertiary structure, and hydrophobic interaction lead to all non-polar R groups being folded into the centre of the molecule and therefore all polar or charged R groups go to the outside of the molecule. Water is a polar molecule and the charges on the R groups can interact with and form hydrogen bonds with the small charges on the water molecules so that the protein is surrounded with water molecules and spread throughout the solution.

ResultsPlus
Examiner Comments

Credit was given for the correct folding, polar R groups, water as a polar molecule and hydrogen bonds between the water and the hydrogen bonds with the R groups.

This response gained no marks.

3 Leeches are parasites that feed by sucking blood. When they bite, they secrete saliva into the wound. The saliva contains a globular protein called hirudin.

(a) Explain why this protein is soluble in water.

(3)

The hydrophillic groups within the amino acid chain have been placed onto the outer surface of the protien. During the creation of the tertiary structure the hydrophillic groups have folded into the center of the protien. This way the protien is soluble in the water.

ResultsPlus
Examiner Comments

The first comment about hydrophilic groups on the outside is correct. However, by then saying they are folded into the centre it is contradictory so does not gain the mark.

ResultsPlus
Examiner Tip

Be careful not to contradict yourself - read back through your responses and check for errors.

Question 3 (b)

Most candidates either described the change in the active site or hirudin binding to the active site, therefore, preventing the substrate from binding.There were some very good descriptions of both competitive and non-competitive inhibition. Some candidates described the active site as being on the substrate and a few suggested that the enzyme could be killed by the hirudin.

This response scored one of the three available marks.

(b) Hirudin is an inhibitor that forms hydrogen bonds with an enzyme.

Explain how hirudin would inhibit the activity of the enzyme.

(3)

when the hirudin attaches to the enzymes it forms hydrogen bond with that enzyme, occupying it and not letting the enzyme catalyse a reaction. If enough hirudin bind to the active site of the enzymes, all the enzymes would be occupied with the hirudin not allowing it to catalyse the reaction it needs to and thus inhibiting the activities of all the enzymes.

ResultsPlus
Examiner Comments

This response gained one mark for the hirudin binding to the active site.

This response gained two of the three marks.

(b) Hirudin is an inhibitor that forms hydrogen bonds with an enzyme.

Explain how hirudin would inhibit the activity of the enzyme.

(3)

Hirudin would be a competetive inhibitor. It would bind to the active site of an enzyme forming hydrogen bonds between itself and the active site. This would prevent a substrate from being able to bind to the active site, preventing the formation of an enzyme-substrate complex therefore inhibiting the enzyme.

ResultsPlus
Examiner Comments

This is an example of a description of a competetive inhibition with credit given for binding to the active site and preventing the formation of an enzyme-substrate complex.

This response gained all three marks.

(b) Hirudin is an inhibitor that forms hydrogen bonds with an enzyme.

Explain how hirudin would inhibit the activity of the enzyme.

(3)

The overall shape of an enzyme is held together with hydrogen bonds. If hirudin forms new hydrogen bonds with an enzyme the shape of the enzyme will change. This will change the shape of the active site meaning the substrate will no longer be able to bind with the active site to form an enzyme - substrate complex. This means the product will not be made. This is a type of non competitive inhibition

ResultsPlus
Examiner Comments

This is an example of a good description of non-competetive inhibition. Marks were gained for changing the shape of the enzyme; changing the shape of the active site and the substrate can no longer bind with the active site.

This response gained no marks.

(b) Hirudin is an inhibitor that forms hydrogen bonds with an enzyme.

Explain how hirudin would inhibit the activity of the enzyme.

(3)

It would cause the enzyme to not fully bond to the active site which means % of yield would decrease. The hydrogen bonds mean HS not a complementary shape any more so will be Competative inhibitor. It will not permantly damage the enzyme.

ResultsPlus
Examiner Comments

This is an example of the many responses that got confused about which molecule has the active site.

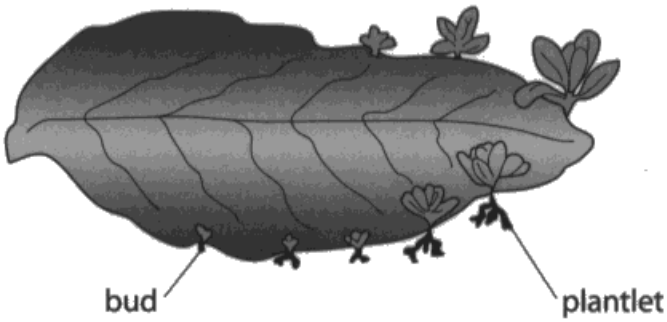
Question 4 (a) (i)

Just over half of the candidates recognised that mitosis was involved.The rest tended to ignore that the question asked for the type of nuclear division and named asexual reproduction or budding as the process.A few candidates thought it was meiosis.

This response gained the mark.

4 The diagram shows a leaf of *Bryophyllum*.

Some of the cells at the edges of the leaf divide to form buds. These buds can develop into individual plantlets.



(a) (i) Name the type of nuclear division that produces the plantlets.

(1)

Mitosis

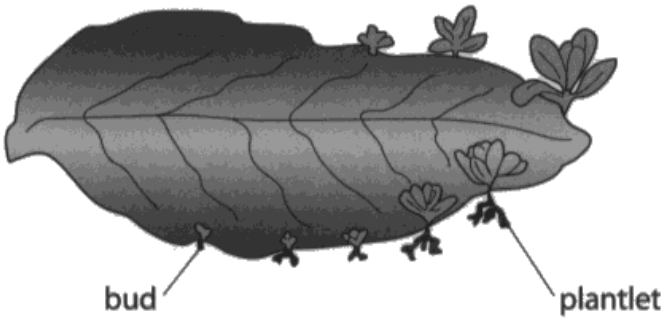
ResultsPlus
Examiner Comments

An example of the correct response.

This response did not gain a mark.

4 The diagram shows a leaf of *Bryophyllum*.

Some of the cells at the edges of the leaf divide to form buds. These buds can develop into individual plantlets.



(a) (i) Name the type of nuclear division that produces the plantlets.

(1)

asexual reproduction

ResultsPlus
Examiner Comments

This may be the name of the type of reproduction but is not the name of the type of nuclear division asked.

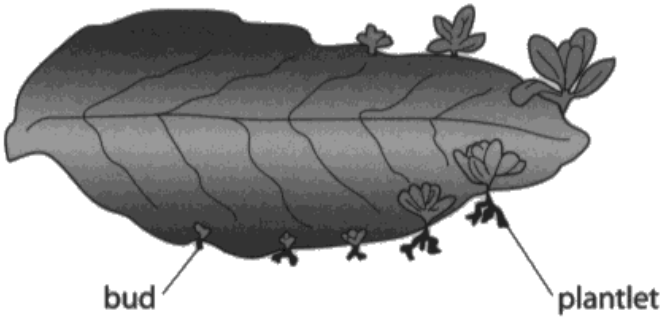
ResultsPlus
Examiner Tip

Read the question carefully.

This response gained no marks.

4 The diagram shows a leaf of *Bryophyllum*.

Some of the cells at the edges of the leaf divide to form buds. These buds can develop into individual plantlets.



(a) (i) Name the type of nuclear division that produces the plantlets.

(1)

Meiosis

ResultsPlus
Examiner Comments

A clear and common error.

Question 4 (a) (ii)

The most common correct answer was that it produces genetically identical plants. Some recognised that it could be a rapid process and produce large numbers and some recognised that in this context the parent plant could provide resources for initial development. Some candidates tried to describe why there was less chance of developing gene mutations through this process.

This response gained both marks.

(ii) State **two** advantages of this type of reproduction.

(2)

One advantage is that it produces a new genetically identical individual and another advantage is that the resources needed for the plantlet to grow are available from the original plant.

ResultsPlus
Examiner Comments

Credit was given here for:

- producing genetically identical individuals;
- the original plant provides resources for the plantlet to grow.

No marks for this response.

(ii) State **two** advantages of this type of reproduction.

(2)

two

it has ~~the~~ full set of chromosomes and so full genetic material that produces two from one.

Increase chance of survival of plantlet ~~for~~ to keep reproducing.

ResultsPlus
Examiner Comments

This response does not explain why it will increase the chance of survival so no credit given.

This response gained both marks.

(ii) State **two** advantages of this type of reproduction.

(2)

~~The~~ It doesn't rely on fertilisation from another cell. It can rapidly produce offspring when needed.

ResultsPlus
Examiner Comments

Credit was gained here for not needing fertilisation and being able to reproduce rapidly.

Question 4 (b) (iii)

Many candidates recognised that meiosis is a source of genetic variation and there were many good descriptions of random assortment and crossing over.There were some very good descriptions of the importance of meiosis being a reduction division.There were some good links to adaptation to environmental change for survival of the species.

Some candidates mentioned variation but did not make it clear that it was genetic variation. Others confused meiosis and mitosis e.g. describing how identical haploid gametes are produced.

This response gained all three marks available.

(iii) Explain the significance of meiosis in living organisms.

(3)

Meiosis increases genetic variation between individuals of the same species through crossing over and random recombination. This can lead to different characteristics within a species, with some ~~speeies~~ characteristics being more advantageous. This increases the chances of a species surviving and being able to adapt to changes in the environment.

ResultsPlus
Examiner Comments

Credit was given for:

- genetic variation;
- through crossing over and random recombination;
- allowing adaptation to changes in the environment.

This response scored one of the three available marks.

(iii) Explain the significance of meiosis in living organisms.

(3)

meiosis is important as it can lead to independent assortment and crossing over. in crossing over, the spindle cross over.

ResultsPlus
Examiner Comments

One mark was awarded for independent assortment/crossing over. There is no explanation about why these processes are important and what they achieve.

This response gained all three marks available.

(iii) Explain the significance of meiosis in living organisms.

(3)

Meiosis ensures that living organisms have genetic variation within their gene pools by recombination, independent assortment and crossing over which prevents inbreeding. Meiosis also halves the number of chromosomes in a diploid cell into four haploid gametes so that offspring will ~~not have~~ have 46 chromosomes such as sporadic 22 chromosomes.

ResultsPlus
Examiner Comments

Credit was given here for:

- genetic variation;
- by crossing over, independent assortment;
- description of reduction division.

This response gained no marks.

(iii) Explain the significance of meiosis in living organisms.

(3)

Meiosis is needed to create four identical daughter cells. This is necessary when an ~~person~~ organism is injured as the large amount of cells created from one parent cell means that the damage can be quickly repaired.

ResultsPlus
Examiner Comments

Several candidates confused meiosis and mitosis.

This response gained no marks.

(iii) Explain the significance of meiosis in living organisms.

(3)

Meiosis is important in living organisms as it allows sexual reproduction to occur. If sexual reproduction did not occur, the species would begin to go extinct, leading to a lack of biodiversity, and the collapse of food chains

ResultsPlus
Examiner Comments

The points made here are not clearly explained e.g. allows sexual reproduction is true, but it does not explain how it allows sexual reproduction to take place.

ResultsPlus
Examiner Tip

Be specific in explain answers and include a good level of detail.

Question 5 (a) (i)

Many candidates compared the magnification and resolution, although some just compared the magnification possible.There were some good comparisons of the wavelength to explain the different resolutions possible. Some candidates described the need for light microscopes to have thin sections so light could pass through them, or that they needed staining. Others described electron microscopes as being able to see 3D objects.

This response gained no marks.

5 Cattle with bovine spongiform encephalopathy (BSE) have microscopic holes in their brain tissue.

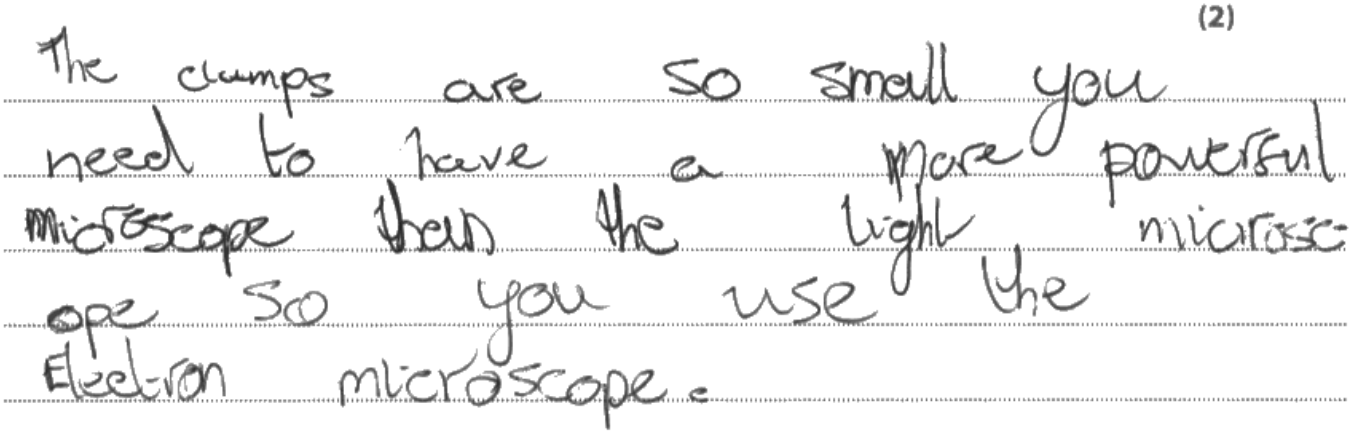
This disease involves the misfolding of proteins which then form clumps.

Clumps of misfolded proteins can be seen with an electron microscope.

(a) BSE is diagnosed by examination of brain tissue.

(i) Explain why the clumps of misfolded proteins can be seen with an electron microscope, but not with a light microscope.

(2)



ResultsPlus
Examiner Comments

More powerful alone is too vague for credit at AS level.

This response gained no marks.

5 Cattle with bovine spongiform encephalopathy (BSE) have microscopic holes in their brain tissue.

This disease involves the misfolding of proteins which then form clumps.

Clumps of misfolded proteins can be seen with an electron microscope.

(a) BSE is diagnosed by examination of brain tissue.

(i) Explain why the clumps of misfolded proteins can be seen with an electron microscope, but not with a light microscope.

(2)

light microscopes give a 2D image whereas electron microscopes the image is a lot clearer and it is also in 3D form. so misfolded protein would be seen in an electron microscope and not a light microscope.

ResultsPlus
Examiner Comments

Some light microscopes can view objects in 3D and many EM images are 2D so this is not a valid comparison.

This response scored one of the two available marks.

5 Cattle with bovine spongiform encephalopathy (BSE) have microscopic holes in their brain tissue.

This disease involves the misfolding of proteins which then form clumps.

Clumps of misfolded proteins can be seen with an electron microscope.

(a) BSE is diagnosed by examination of brain tissue.

(i) Explain why the clumps of misfolded proteins can be seen with an electron microscope, but not with a light microscope.

(2)

Electron microscopes have a higher magnification than light microscopes and allow for the contents of a cell, for example specific organelle, to be viewed under an electron microscope

ResultsPlus
Examiner Comments

One mark here for higher magnification.

This response gained both marks.

5 Cattle with bovine spongiform encephalopathy (BSE) have microscopic holes in their brain tissue.

This disease involves the misfolding of proteins which then form clumps.

Clumps of misfolded proteins can be seen with an electron microscope.

(a) BSE is diagnosed by examination of brain tissue.

(i) Explain why the clumps of misfolded proteins can be seen with an electron microscope, but not with a light microscope.

(2)

- Electron microscopes can see a much higher resolution and magnification than light microscopes
- The misfolded proteins will be very small (light can only see larger organelles) so need high mag. and resolution to be visible
- Because electron microscopes send beam of electrons over beam of light which have shorter wave length

ResultsPlus
Examiner Comments

Credit was given here for:

- higher resolution;
- higher magnification;
- because electrons have a shorter wavelength.

For a maximum of two marks for the question.

Question 5 (a) (ii)

Most candidates gained a mark for being able to distinguish cells/organelles, a few discussed contrast.There were a lot of vague or awkward descriptions. Few candidates explained what the stain might do unless they provided a clear example of a named stain.

This response did not gain any marks.

(ii) Explain why stains are used when preparing tissue for examination using a light microscope.

(2)

As tissue & cells are colourless therefore we need a stain to give the cells colour so we can see them wher the light passes thoug.

ResultsPlus
Examiner Comments

This is a typical example of the many responses that had an idea of the need for a stain but were not able to express themselves clearly enough or explain how the stain works.

This response scored one of the two available marks.

(ii) Explain why stains are used when preparing tissue for examination using a light microscope.

(2)

• stains are used because they stain the chromosomes or the chromatids, ~~they~~ they do this by attaching to the chromosomes.

ResultsPlus
Examiner Comments

The mark was gained here for the stain attaching to the chromosomes, but they have not explained what that achieves.

This response scored one of the two available marks.

(ii) Explain why stains are used when preparing tissue for examination using a light microscope.

(2)

It creates contrast between the ~~cells~~ Cells that are trying to be seen and the ones that are not, allowing the person looking into it get a better picture / image.

ResultsPlus
Examiner Comments

The mark was gained here for creating the contrast, but they have not gone onto explain how the stain achieves this.

This response gained both available marks.

(ii) Explain why stains are used when preparing tissue for examination using a light microscope.

(2)

Stains are taken up by the tissue sample and absorbed allowing organelles and other structures to be seen clearly it creates contrast for the both tissue structures.

ResultsPlus
Examiner Comments

Marks were awarded for the stain being taken up by the tissues and creating contrast.

Question 5 (b) (i)

There were a lot of good specific descriptions of secondary structure commonly giving the names of the two formations and mentioning hydrogen bonds. Some responses described peptide bonding or the tertiary structure and bonding.

This response scored both of the available marks.

(b) The misfolded proteins have a changed secondary structure. Therefore they cannot be digested by some protease enzymes.

(i) Describe what is meant by the secondary structure of a protein.

(2)

Secondary structure is the folding the polypeptide chains into alpha helix spiral or Beta pleated sheets. The new shapes are also held by a lot of hydrogen bonds.

ResultsPlus
Examiner Comments

Credit was gained here for:

- folding of the polypeptide chain;
- into alpha helix or beta pleated sheet;
- held by hydrogen bonds.

For a maximum of two marks.

This response scored 0.

(b) The misfolded proteins have a changed secondary structure. Therefore they cannot be digested by some protease enzymes.

(i) Describe what is meant by the secondary structure of a protein.

(2)

The secondary structure of the protein is the shape that the baric sequence of amino acids takes, be it branched, unbranched or chains laying beside one another.

ResultsPlus
Examiner Comments

There is nothing specific enough here for credit.

This response scored 0.

(b) The misfolded proteins have a changed secondary structure. Therefore they cannot be digested by some protease enzymes.

(i) Describe what is meant by the secondary structure of a protein.

(2)

The bonds are not in the correct place so it changes the overall ~~look~~ structure and function of the protein.

ResultsPlus
Examiner Comments

This is another example of a candidate not reading the question carefully enough.

Question 5 (b) (ii)

Most candidates were able to describe why the misfolded protein would not fit into the active site due to the active site being specific. It was extremely rare for candidates to be specific and relate to the digestion of proteins through hydrolysis of peptide bonds.

Some candidates described substrates with active sites, and protease enzymes not being able to fit into the active site. Some described "tougher or different bonds that protease enzymes can't digest". Many described the enzyme having the changed shape and therefore the substrate not fitting, rather than the misfolded protein.

This response scored two of the three available marks.

(ii) Explain why the misfolded protein cannot be digested by some protease enzymes.
(3)

The misfolding of the protien effects the protiens structure and shape. As enzymes active sites are specifict to the shape of a substrate they cannot bind to the mishaped or substrate to make an enzyme substrate complex and break the ~~prote~~ protien down. Therefore ~~mispp~~ misfolded proteins do not fit the protease enzymes active site so cannot be digested.

ResultsPlus
Examiner Comments

Credit was gained here for:

- the active site is specific;
- the misfolded protein cannot bind to the active site.

They can't be digested is not specific enough for AS level and this context for the third mark.

This response gained no marks.

(ii) Explain why the misfolded protein cannot be digested by some protease enzymes.
(3)

Because the protein's shape is distorted or deformed, ~~which acts as a substrate so~~ therefore its active site must have a deformed shape so the enzyme cannot fit into it and form a complex to digest it.

ResultsPlus
Examiner Comments

This is an example of the many responses that thought the active site was part of the protein and not the enzyme.

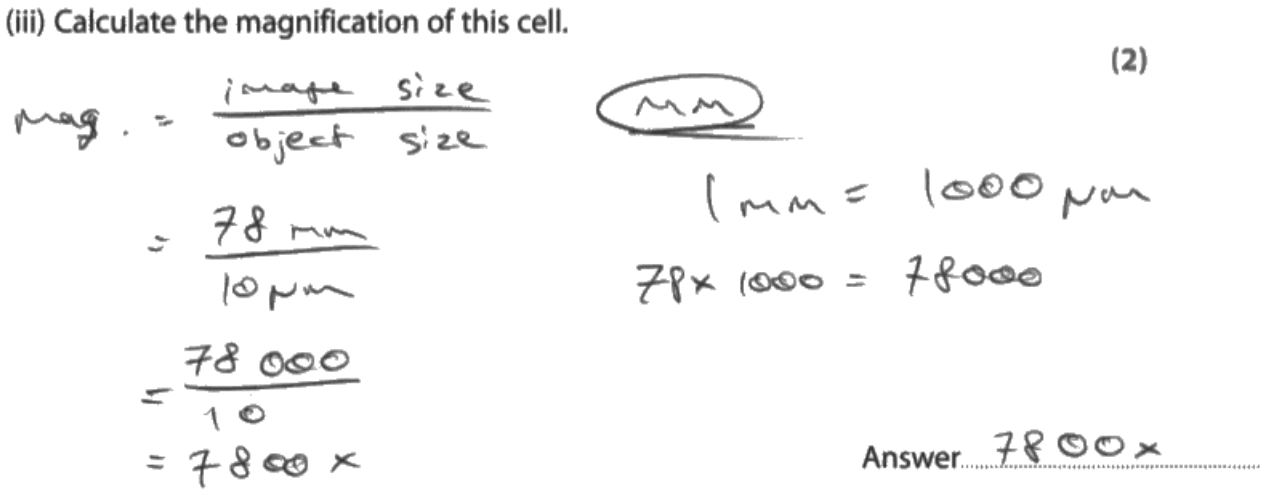
ResultsPlus
Examiner Tip

Remember - the active site is part of an enzyme!

Question 6 (a) (iii)

Most candidates were unable to calculate the magnification of this cell.The majority of errors came from the conversion of the length of the line into μm so they could use the equation they had learnt.

This response gained both available marks.



ResultsPlus
Examiner Comments

An example of the correct calculation, with clear steps in the working illustrated.

This response scored 0.

(iii) Calculate the magnification of this cell.

(2)

size of drawing = 7.8 cm = 7800 μm

size of actual cell = 10 μm = [illegible]

$\frac{7800}{10} = 780$

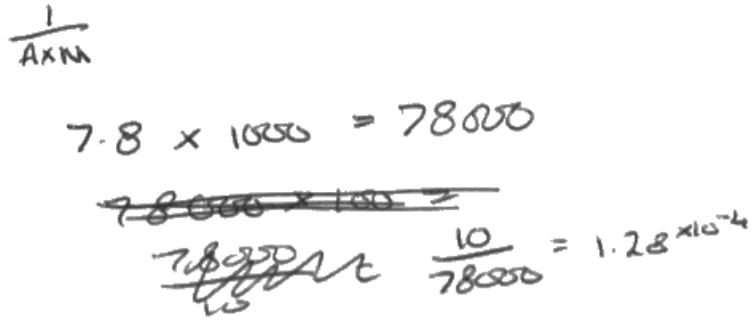
Answer x 780

ResultsPlus
Examiner Comments

This is an example of a common error when dealing with converting measurements from cm instead of mm.

This response scored one of the two available marks.

(iii) Calculate the magnification of this cell. (2)



Answer .....

ResultsPlus
Examiner Comments

This candidate managed to convert the measurement into the same units, but got the equation the wrong way round. They were awarded one mark for their clear working.

ResultsPlus
Examiner Tip

Make all steps in your calculation clear as you may gain marks for your method - like this example.

Check that your answer makes sense, is the actual cell likely to be thousands of times bigger than the image on the paper! If your answer does not make sense check your working.

This response scored 0.

(iii) Calculate the magnification of this cell. (2)

image size / mag = actual size

× mag

~~image size = actual size × mag~~

÷ ÷ a



image size / actual size = mag

7.7 / 10mm = 7.7

Answer 7.7

ResultsPlus
Examiner Comments

This is an example of the many responses from candidates that knew what equation to use, but failed to convert the measurements into the same units.

Question 6 (a) (iv)

There were several good answers that were awarded all 3 marks. More often, 2 marks were awarded; usually proteins were either made or more commonly secreted by pancreatic cells, but not always both. Some answers specified the production of insulin. There was generally a lot of discussion about pancreatic cells needing lots of energy for their functions but no indication of what that function might be, or that mitochondria are the site of respiration but nothing further. Some candidates stated that ATP is needed for respiration, and some stated that protein synthesis occurs in the mitochondria. Z variously named as ribosomes, lysosomes, Golgi apparatus, but it was usually correctly identified.

This response scored one of the three available marks.

(iv) Explain why these pancreatic cells contain large numbers of organelle **Z**.

(3)

Because Z is mitochondria. Mitochondria creates ATP (~~alternative~~ adenosine triphosphate) which ~~pro~~ produces energy which is accessible to the cell. Pancreatic cells perform a lot of activity and so need a lot of energy (and ATP)

ResultsPlus
Examiner Comments

This gains a mark for recognising ATP production but a lot of activity is not clear enough, particularly given the context of the question.

This response scored 0.

(iv) Explain why these pancreatic cells contain large numbers of organelle **Z**.

(3)

Pancreatic cells are ~~secretory~~ Secretory cells and therefore produce large amounts of substances so be passed out the cell require large amounts of energy and need to do large amounts of respiration.

ResultsPlus
Examiner Comments

This is a typical example of a response that has not been specific enough for credit. They have not made it clear what is produced/secreted or in what form the energy is released from the mitochondria.

ResultsPlus
Examiner Tip

Use AS specific detail in your responses to get credit.

This response gained all three marks.

(iv) Explain why these pancreatic cells contain large numbers of organelle Z.

(3)

The organelle Z is the mitochondria, this is used in the process of respiration to produce ATP (energy). Therfor, this cell would need to contain a large number of mitochondria because the cell has a very long and constant job of producing and secreting proteins, this cell needs to produce a large quantity of these protens regulaely which in responce uses a lot of ATP (energy) to do so, therfor it need the large amount of mitochondria in order to keep up with the work load it does.

ResultsPlus
Examiner Comments

Credit was given here for:

- mitochondria produce ATP;
- needed for producing;
- **and** secreting proteins.

This response scored two of the three available marks.

(iv) Explain why these pancreatic cells contain large numbers of organelle **Z**.

(3)

Organelle Z is a mitochondria. The function of mitochondrion is to produce ATP for respiration. These pancreatic cells have a lot of mitochondrion because they need a lot of energy to secreat proteins.

ResultsPlus
Examiner Comments

Credit was given here for:

- mitochondria produce ATP;
- to secrete proteins.

Question 6 (b)

Approximately 1/3 of candidates drew a good structural diagram achieving all 3 marks. Where 1 or 2 marks were awarded, it was generally for carelessness and missing a H off somewhere, or a double bond. Approximately 1/3 of candidates appeared to have had no idea where to start and drew boxes to represent amino acids connected by a line, or attempted diagrams of DNA/nucleotides instead.

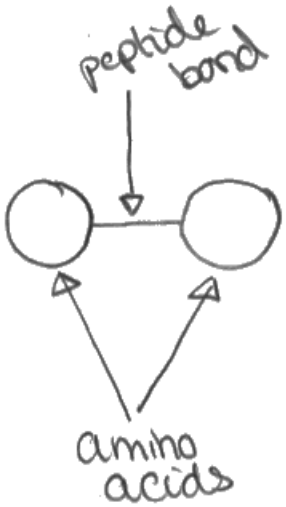
This response scored 0.

(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)



ResultsPlus
Examiner Comments

This is a diagram of a dipeptide - but this is not a structural diagram so is not worthy of credit.

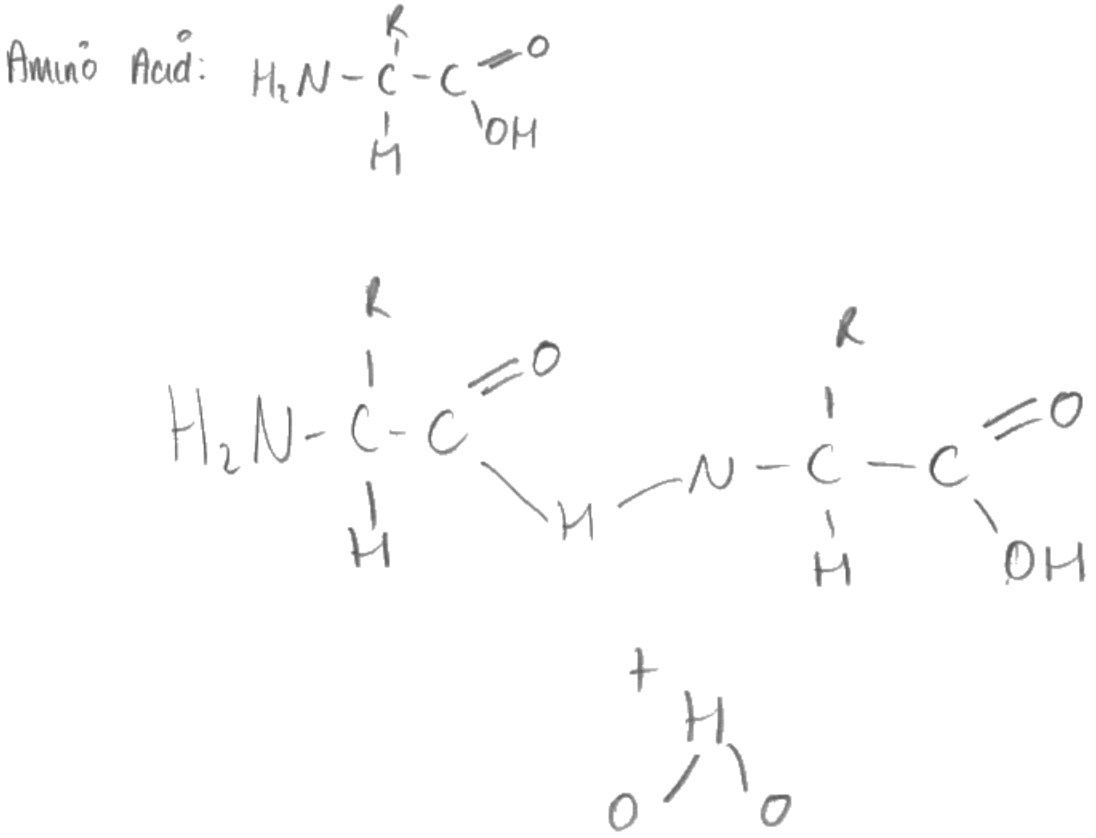
This response scored two of the three available marks.

(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)



ResultsPlus
Examiner Comments

This candidate lost a mark for the incorrect peptide bond.

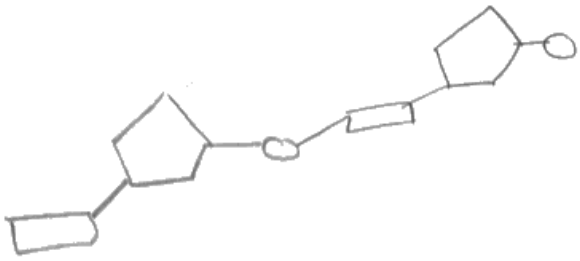
This response gained 0

(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)



ResultsPlus
Examiner Comments

This is an example of the many attempts at a nucleic acid structure seen in response to this question.

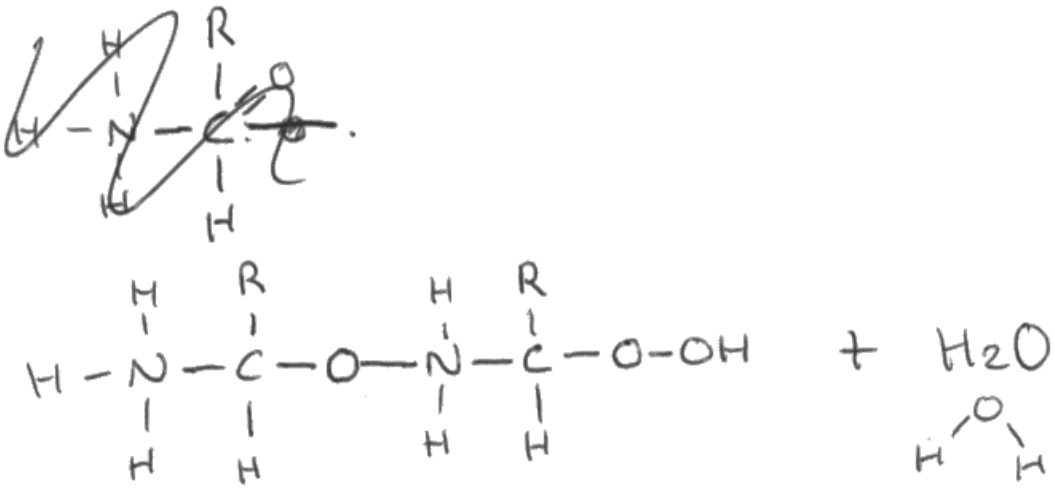
This response scored one of the three available marks.

(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)



ResultsPlus
Examiner Comments

Credit was given here for having a C attached to a H and an R on each side of the dipeptide. The peptide bond is wrong as is the NH_3 group NH_3 only if it has a charge) and the COOH group.

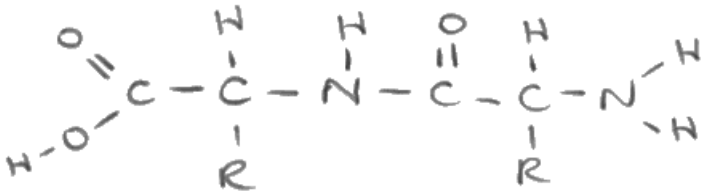
This response gained all three marks.

(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)



ResultsPlus
Examiner Comments

This is a typical example of the correct structure for all three marks.

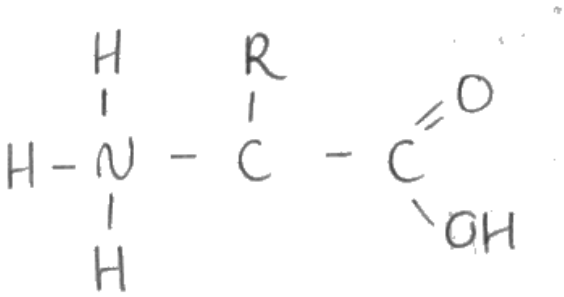
This response scored 0

(b) The secreted proteins are made from amino acids.

Two amino acids join together to form a dipeptide.

Draw a diagram to show the structure of a dipeptide.

(3)



ResultsPlus
Examiner Comments

A slightly incorrect diagram of a single amino acid is not a dipeptide so did not gain any marks.

Question 7 (b) (i)

Most candidates gained a mark for describing the levelling off, with better responses including reference to the Benedict's solution becoming limiting. Many candidates quoted all sorts of figures from the data but were unable to describe the relationship clearly. Those who attempted to describe the relationship limited their description to a positive correlation.

This response scored one of the four available marks.

(i) Analyse the data to explain the relationship between the glucose concentration and the mass of precipitate formed.

(4)

As glucose concentration increases the mass of precipitate formed also increases. ~~until the~~ This is until the glucose concentration reaches 16 mg/cm^{-1} where the mass of precipitate formed stops and stays at 2·00g formed. At the beginning when the glucose increases to 8 mg/cm^{-1} the mass formed increases rapidly then slows down above the glucose concentration of 10 mg/cm^{-1}.

ResultsPlus
Examiner Comments

This is typical of the many responses that gained one mark for identifying that the increase stopped after 16. The trend before 16 is not clearly described or explained and why it stops increasing is also not explained.

ResultsPlus
Examiner Tip

When asked to analyse data to explain a relationship there needs to be more than just a description of the trend

This response scored 0.

(i) Analyse the data to explain the relationship between the glucose concentration and the mass of precipitate formed.

(4)

As the glucose concentration increases, the more the ~~g~~ mass of precipitate formed The mass of precipitate formed increases as the glucose concre~~on~~ concentration rises.

ResultsPlus
Examiner Comments

A partially correct trend identified but not specific enough for this level.

This response scored three of the four available marks.

(i) Analyse the data to explain the relationship between the glucose concentration and the mass of precipitate formed.

(4)

The table shows that as the glucose concentration is increased, so the mass of precipitate formed also increases. The higher the glucose conc, the higher the mass of precipitate formed. At 2mgcm^{-3} the precipitate formed was 0.28g whereas at 20mg cm^{-3} the precipitate formed was 2.00g. The glucose conc was being doubled each time while the Benedicts reagent was the control variable. The precipitate basically doubled at first from 0.28 to 0.57mgcm^{-3} but as this went on it got less and less each time as area now longer in excess. It then didn't change from 2.00g after 16 mgcm^{-3} as the Benedicts sol was the

ResultsPlus
Examiner Comments

Credit was given here for:

- as glucose doubles the precipitate doubles;
- up to 2.00g;
- because Benedict's becomes the limiting factor.

This response scored three of the four available marks.

(i) Analyse the data to explain the relationship between the glucose concentration and the mass of precipitate formed.

(4)

The data shows that glucose concentration and mass of precipitate formed have a positive correlation until the point of 16 mg cm^{-3} glucose concentration, where 2 g of precipitate are formed in all subsequent reactions. This is because only 5 cm^3 of Benedicts' reagent is used in each test, and all of the reagent reacts fully to produce 2 g of precipitate, however leaving some glucose unreacted in the 16, 18 and 20 mg cm^{-3} glucose reactions.

ResultsPlus
Examiner Comments

Credit was gained here for:

- all of the glucose reacts with the Benedicts;
- no increase above 16;
- because there is unreacted glucose above 16.

Question 7 (b) (ii)

Approximately 40% of candidates were able to calculate the percentage error correctly. A few candidates lost the mark for incorrectly rounding their numbers down.

This response gained the mark

(ii) When the investigation was repeated, the mean error for each measurement was calculated.

The mean error for each measurement was 0.05 g.

Calculate the percentage error for the mass of precipitate measured at the glucose concentration of 2 mg cm^{-3}.

(1)

$\frac{0.05}{0.28}$ ~~x100~~

$= 0.179 \times 100 = 17.9$ Answer 17.9 %

ResultsPlus
Examiner Comments

An example of the correct calculation.

This response scored 0.

(ii) When the investigation was repeated, the mean error for each measurement was calculated.

The mean error for each measurement was 0.05 g.

Calculate the percentage error for the mass of precipitate measured at the glucose concentration of 2 mg cm^{-3}.

(1)

0.28

0.05/0.28 = 0.1785

Answer ~~18~~ 17.85 %

Y100 = 17.85

ResultsPlus
Examiner Comments

An example of incorrect rounding down.

This response scored 0.

(ii) When the investigation was repeated, the mean error for each measurement was calculated.

The mean error for each measurement was 0.05 g.

Calculate the percentage error for the mass of precipitate measured at the glucose concentration of 2 mg cm^{-3}.

(1)

~~0.05~~ / 100

0.05 / 2 → 1/40 · 100 → 2.5%

Answer 2.5% %

ResultsPlus
Examiner Comments

This is an example of using the wrong values for the calculation.

Question 7 (b) (iii)

Many candidates identified the value of repeat measurements but did not go onto state that this would reduce the standard deviation.Other common answers referred to using more accurate/precise balance scale.There were some very good references to increased drying time until a constant mass was achieved, and extra filtering to collecting all the precipitate.

This response gained both marks.

(iii) Explain one way in which the mean error in measuring the mass of precipitate could be reduced.

(2)

use a balance which records mass to a higher number of decimal places

- Wash by dry out the filter and collect the precipitate left in the filter

- Rinse out the mixture when pouring the solution through the filter, to ensure all precipitate is collected.

ResultsPlus
Examiner Comments

This response gained marks for describing how to collect all of the precipitate to make sure all of the precipitate was measured and collected.

This response gained both marks

(iii) Explain one way in which the mean error in measuring the mass of precipitate could be reduced.

(2)

The precipitate could have been left to drig for longer until the mass remained unchanged. This shows that all of the solution was evaporated.

ResultsPlus
Examiner Comments

A good description of a technique that was worth both available marks.

This response scored one of the two available marks.

(iii) Explain one way in which the mean error in measuring the mass of precipitate could be reduced.

(2)

Use scales that are accurate and have been checked and measure the mass of the precipitate 3 times, being careful not to lose any of the precipitate during weighing, and take a mean calculation of all 3 measures.

ResultsPlus
Examiner Comments

This was a very common response. It only gets one of the two marks as it does not explain how this will reduce the mean error.

Question 8 (a)

Most candidates recognised that the virus was unable to replicate independently with several describing why e.g. use of the cell's ribosomes for protein synthesis.There were lots of irrelevant descriptions of how viruses invade cells and/or replicate using the host cell.

This response scored one of the two available marks.

8 Some viruses cause infections in humans.

Antiviral drugs affect the virus without affecting the cells of the host.

(a) Explain why viruses are dependent on living cells.

(2)

Because viruses can't reproduce without a host. They aren't made of cells and therefore can't divide and reproduce they relye on the host to do that for them.

ResultsPlus
Examiner Comments

One mark given for can't reproduce without a host, but they have not explained why they need a host cell to replicate.

This response gained both marks available.

8 Some viruses cause infections in humans.

Antiviral drugs affect the virus without affecting the cells of the host.

(a) Explain why viruses are dependent on living cells.

(2)

Because they use the living cells to reproduce. They use the ~~Ribosomes to reproduce.~~ living cells Components to reproduce. They use Ribosomes to Replicate itself. The only way they replicate is by living cells

ResultsPlus
Examiner Comments

Credit given for:

- the only way they replicate is by living cells;
- use ribosomes.

This response scored 0.

8 Some viruses cause infections in humans.

Antiviral drugs affect the virus without affecting the cells of the host.

(a) Explain why viruses are dependent on living cells.

(2)

Viruses are dependant on living cells because they can't produce their own nutrients to survive, so they invade host cells and use their resources to live.

ResultsPlus
Examiner Comments

Nothing worthy of credit in this response.

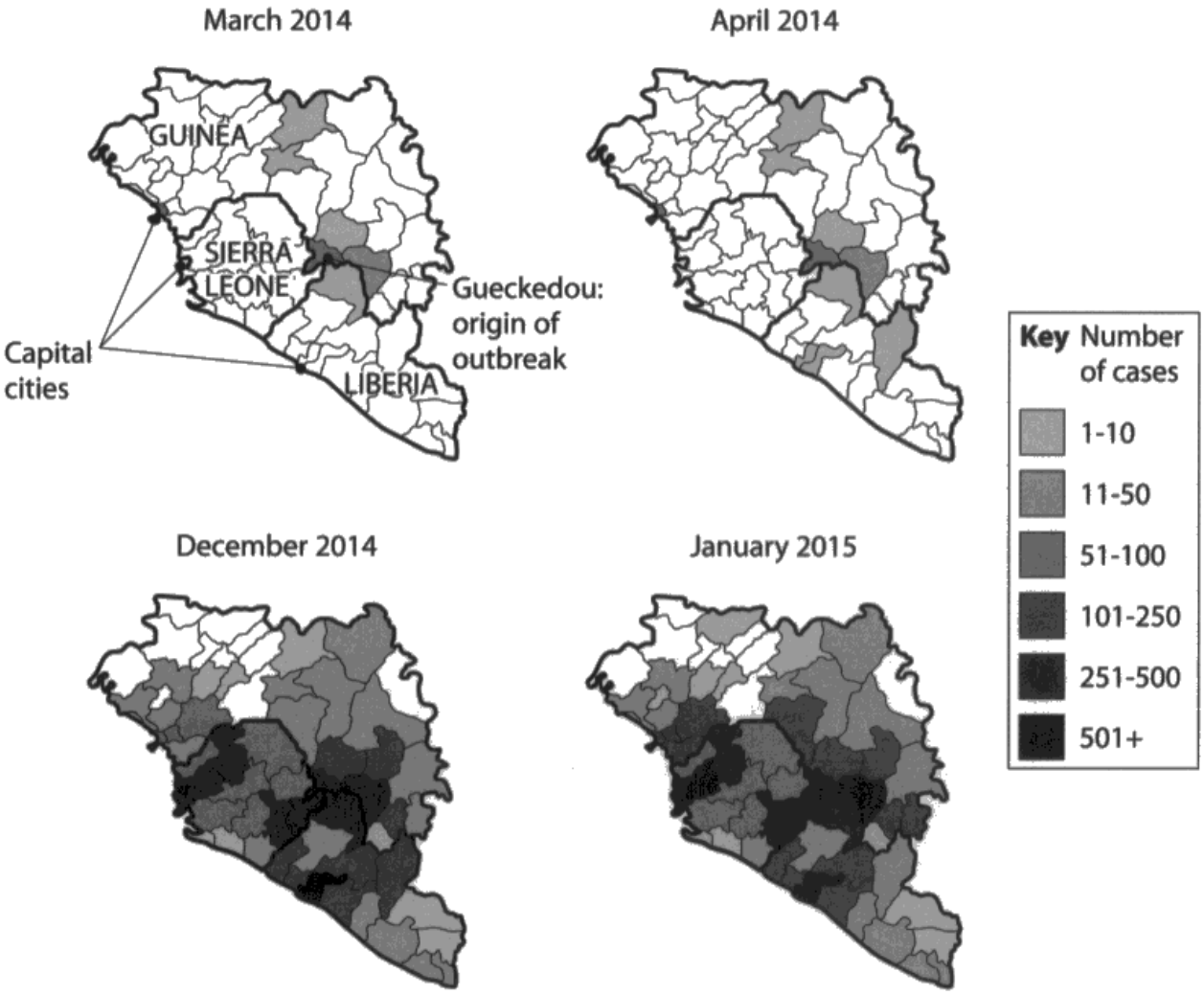
Question 8 (b) (i)

Although there was a lot of indicative content available and a lot of data for discussion, few candidates gave good level 3 responses. The majority of candidates did use data from both sources in their descriptions and so accessed level 2, although often just a low level description. There was very little evidence of analysis. For example little linking or comparison of the maps and graph. Many hadn't looked at the information carefully enough and made sweeping generalisations, assuming that the outbreak/maps showed the whole of Africa, or the graph represented all 3 countries and not just Sierra Leone. Lots of candidates were able to identify higher incidence in the cities and cited population density as instrumental in the spread. Some linked travel and movement. Others discussed how a few areas in Guinea did not have any/many cases, but most went on to say that these areas must have had better sanitation/hygiene. The majority of candidates quoted figures from the sources, not always accurately, and some even quoted different data for the same area without making the link that the sources did not always support each other. Very few candidates moved beyond a description of the data seen and if they did they explained the trends. Analysis should compare and evaluate the data provided e.g. recognise what data is missing for a conclusion to be drawn.

This response scored three of the six available marks.

The maps show the number of reported cases in districts of Sierra Leone, Guinea and Liberia in four months recorded during the outbreak.

The capital cities of these three countries are also shown.



*(i) Analyse the information in the graph and maps to comment on the spread of Ebola in West Africa.

(6)

Ebola spread very rapidly in West Africa. The graph shows that by during January 2015, number of cases of ebola per week were at its highest, with most areas of africa having at least 1-10 cases, some having 501+. The most cases of ebola seemed to be around where the ~~origno~~ orgin of the outbreck in Guechdou. North

West Africa had few cases even during the heights of Jonury 2015. The outbreck seemed to spread rapidly from March 2014 when the first case occured to January 2015, increasing at a rate of around 550 cases a week per month up until the highest point. Haever, the outbreck was dealt with rapidly as shown in the huge decreases in cases a week, with less than 10 in January 2016.

ResultsPlus
Examiner Comments

This is an example of the most common response to this question.

This response gets into level 2 as it clearly makes reference to data from both the maps and the graph to describe some of the trends and patterns. The level of analysis and detail is relatively low and there is no comparison between the data sets so this was awared 3 marks.

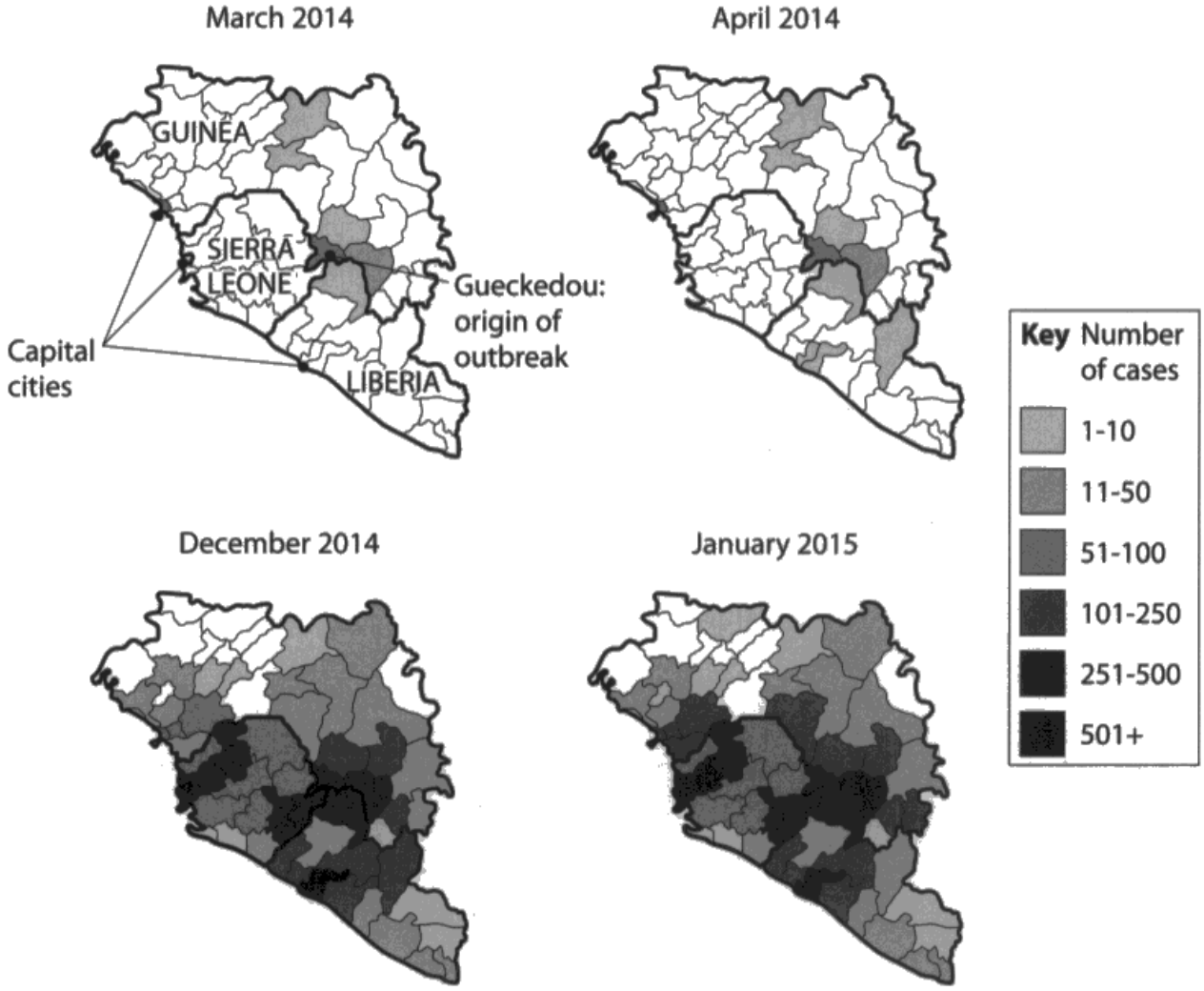
ResultsPlus
Examiner Tip

When asked to analyse data compare and evaluate the data provided for a full response, don't just describe the trends seen.

This response scored two of the six available marks.

The maps show the number of reported cases in districts of Sierra Leone, Guinea and Liberia in four months recorded during the outbreak.

The capital cities of these three countries are also shown.



*(i) Analyse the information in the graph and maps to comment on the spread of Ebola in West Africa.

(6)

Between March and April 2014, the virus only spreads to 2 new areas, however one of those areas is the capital city of Liberia, meaning 2 of 3 capital cities in these nations ~~are~~ now have infected people. Capital cities are generally areas of high population density, ~~[illegible]~~ meaning the virus would spread from person-to-person

very quickly and easily. Furthermore, as these countries are generally quite ~~&~~ underdeveloped, meaning poor sanitation and hygiene, so the virus would be more easily passed on through poor water supplies or overcrowded hospitals. 8 months later, in December 2014, the virus had spread across most of West Africa, with the first affected areas generally having the largest number of reported cases. At this point, only Liberia's capital had upwards of 500 cases. The capitals of Sierra Leone and Liberia were some of the most affected regions, however with 251-500 cases. However, the capital of Guinea was only on 101-250 cases. By January 2015, Sierra Leone's capital and another couple of regions, the capital of Liberia and one region in Guinea ~~have~~ had reported over ~~500~~ 500 cases of Ebola. Many surrounding regions had between 251-500 cases and regions surrounding them had around 101-250 cases. By this point, many areas in West Africa were very badly affected, all taking place in 9-10 months.

ResultsPlus
Examiner Comments

This response was limited to level 1 as the candidate only described and used data from the maps and ignored the information provided in the graph.



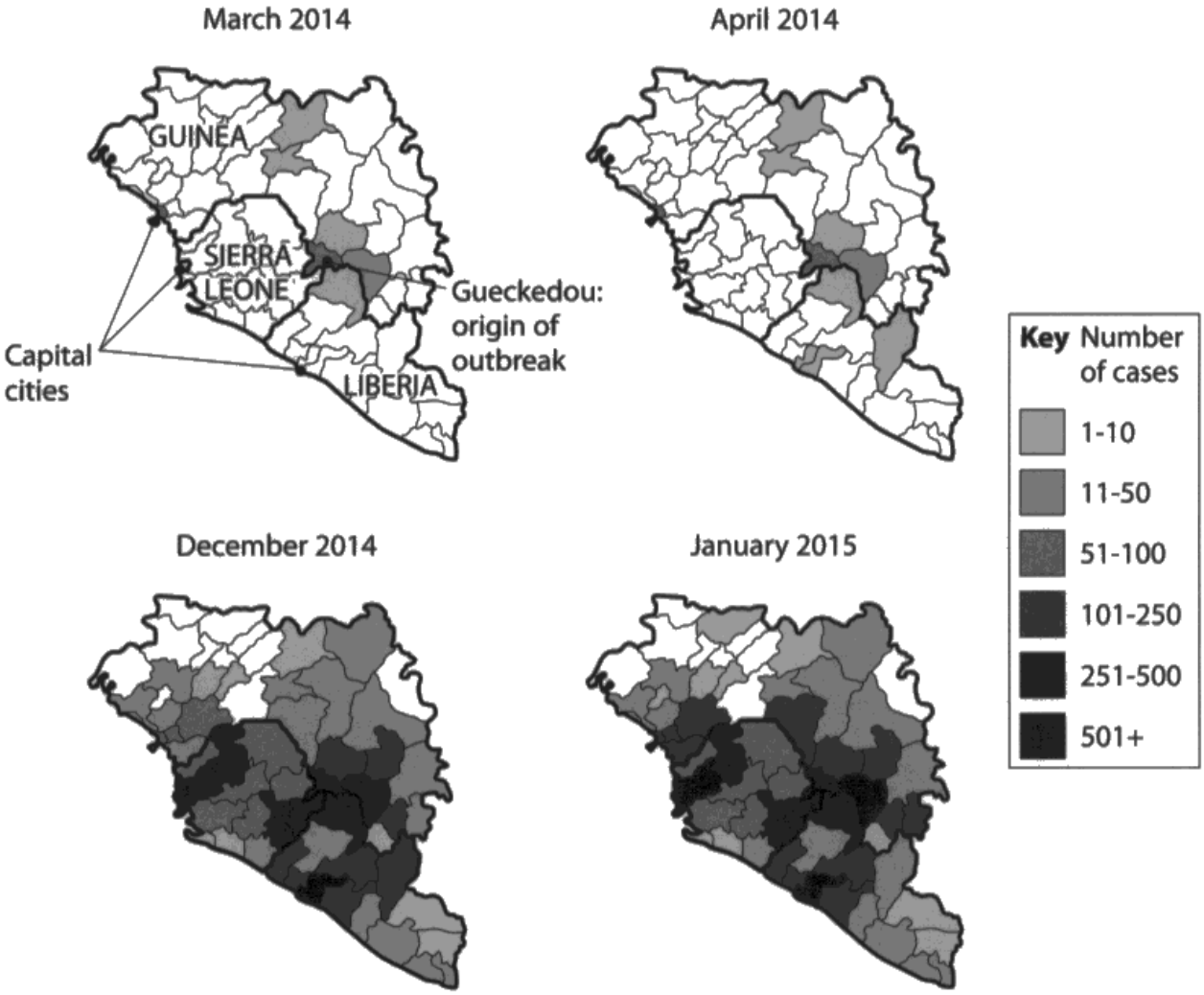
Examiner Tip

When given multiple data sources to analyse make sure you make reference to all of them.

This response gained five of the six marks available.

The maps show the number of reported cases in districts of Sierra Leone, Guinea and Liberia in four months recorded during the outbreak.

The capital cities of these three countries are also shown.



*(i) Analyse the information in the graph and maps to comment on the spread of Ebola in West Africa.

(6)

When the ebola outbreak occurred in 2014, the number of reported cases was low as in march and April as the ~~onto~~ outbreak had just begun. December ~~and~~ 2014 and January 2015 had shown a significant rise in cases as it had spread to Guinea and Liberia. This is due to the lack of healthcare as they are less economically developed. The origin of the outbreak has 251-500 cases. Due to the lack of healthcare and help from other countries, the number of cases

had risen. Areas around the outbreak had a large number of cases, but ~~whereas as~~ ~~as you as~~ ~~touch~~ Guinea had much lower ~~less~~ amounts of cases.

Between January 2015 and January 2016, the number of cases of ebola had been reduced at a fast rate from roughly 550 cases a ~~week to week~~ week to less than 100 cases per week. This indicates that help had been ~~from~~ provided ~~for~~ from other countries and certain ~~drugs~~ drugs, vaccines and other forms of medication had been ~~by~~ provided provided to the people affected by the illness.

Overall, the spread of ebola had drastically decreased ~~after from January 2015 only for~~ for Sierra Leone, but it ~~only~~ doesn't show if the number of cases had been reduced in Guinea, which is the origin of the outbreak. Also ~~the~~ other areas have been ~~or~~ affected and have ~~large~~ large amounts of cases such as the border of Liberia and Guinea. If these areas were not helped, then the virus can still spread as they've not been ~~to treat~~ treated.

ResultsPlus
Examiner Comments

This is an example of a level 3 response for 5 of the 6 marks because not only does it make use of data from both the graph and the maps it recognises that the graph does not tell us whether the number of cases also goes down in other areas so there is an element of evaluation of the data provided.

Question 8 (b) (ii)

The need to Isolate patients was very commonly identified and many answers usually cited several measures for preventing transmission like using some kind of protective clothing, sterilisation and disposal of equipment etc. Some responses included reduced transport and isolation of people in contact with patients or screening programmes.There was often discussion about the disposal of dead bodies but not in relation to education programs. Despite the information in the question saying there was no vaccine available a lot of candidates made reference to a vaccination programme.

This response gained all three marks.

(ii) Describe the methods used to prevent the spread of Ebola.

(3)

> nursing in isolation meaning take the patient away from the bound areas of the city in an environment where they have less contact with others.

> wear protective clothing, this is beneficial for doctors to ensure their hands and faces are protected to prevent being infected.

> [illegible] for the nurses & the doctors and other health care assistants involved in caring for the patient patients should be tested on regular basis.

ResultsPlus
Examiner Comments

Credit gained for:

- isolation;
- protective clothing;
- regular testing of doctors and healthcare workers.

This response scored one of the three available marks.

(ii) Describe the methods used to prevent the spread of Ebola. (3)

→ Quarantine → to prevent spread
→ IV drips → to keep hydrated

ResultsPlus Examiner Comments

This gains a mark for quarantine. The IV drip is irrelevant for the prevention of the spread of Ebola.

This response scored two of the three available marks.

(ii) Describe the methods used to prevent the spread of Ebola. (3)

Ebola spread can be prevented by identifying patients who are infected and isolating them away from those who are not. It would also be important to sterilise equipment, bedding and clothing which come in contact with the infected individual. Finally, to prevent the spread of Ebola health workers should wear protective clothing which would reduce their chance of picking up the disease or even spreading it.

ResultsPlus Examiner Comments

Credit was gained here for:

- isolation;
- sterilising equipment and wearing protective clothing.

This response scored two of the three available marks.

(ii) Describe the methods used to prevent the spread of Ebola.

(3)

I isolate the patients suffering from ebola to prevent spread. Educate people who are living in areas where ebola may spread so they can prevent themselves from being infected. ~~they would be~~ These methods will reduce the total amount of people who are infected by ebola.

ResultsPlus
Examiner Comments

Credit was gained for:

- isolation of patients;
- education to prevent transmission.

Question 8 (c)

Few candidates attempted to make a fully evaluative response and there was rarely any sort of conclusion made.

Most candidates provided reasons why untested drugs should not be used but without linking it to the context. Possible side effects was the most common mark awarded although many also thought that this drug would probably make the condition worse – ie amplifying the effects of ebola itself rather than causing additional symptoms. Many candidates suggested that the patients would feel like guinea pigs. Many seemed to confuse anti virals with vaccines and how vaccines can sometimes cause mild symptoms of the disease.There were attempts at describing issues of consent or decisions about who should be treated but these often lacked clarity or clear context.

The majority of answers concentrated on reasons against the use of a drug. Reasons in favour of using the drug were much rarer, and when they were seen it was generally for recognising the severity of the disease.This was perhaps caused by many candidates ignoring the context of this epidemic and just recalling general reasons for not using an untested drug.

Very occasionally, candidates had covered four marking points but had not given a conclusion so only 3 marks were awarded.

This response gained all four marks.

(c) During this outbreak of Ebola, no vaccine had been developed.

The World Health Organisation recommended that untested antiviral drugs could be used to treat patients, due to the scale of the outbreak.

Evaluate the ethical implications of using an untested drug during this outbreak.

(4)

There are some negatives because they could ~~give~~ cause side effects or not help treat them however there had been so many deaths already and if they weren't given the drugs they would most likely die anyway that it was worth the risk and would make the drug testing to find a cure much quicker by using the patients.

(Total for Question 8 = 15 marks)

+ve	~~N~~ -ve
- Die otherwise	- side effects
- Research faster	- could make them worse.

ResultsPlus
Examiner Comments

Credit was given for:

- recognising the severity of the disease;
- some side effects or not working;
- help find a cure;
- coming up with a conclusion "it was worth the risk..."

This response scored two of the four available marks.

(c) During this outbreak of Ebola, no vaccine had been developed.

The World Health Organisation recommended that untested antiviral drugs could be used to treat patients, due to the scale of the outbreak.

Evaluate the ethical implications of using an untested drug during this outbreak.

(4)

Unknown side-effects, such as death, may be result of a drug that has not been fully tested. By treating ill patients with the drugs that have not been fully developed, you may be shortening their lives or harming them further. You would not be able to provide full informed consent as it would not be possible to completely predict all possible side-effects of untested drugs.

ResultsPlus
Examiner Comments

This gained credit for:

- unknown side effects;
- not able to provide full informed consent.

This response scored one of the four available marks.

(c) During this outbreak of Ebola, no vaccine had been developed.

The World Health Organisation recommended that untested antiviral drugs could be used to treat patients, due to the scale of the outbreak.

Evaluate the ethical implications of using an untested drug during this outbreak.

(4)

If the untested drug had unknown side effects they could make the virus worse. Also patients had freedom of choice - if they don't want to take it they don't have to. Another ethical implication is that they using a drug without its human testing is dangerous

ResultsPlus
Examiner Comments

This gains one mark for the unknown side effects. It is typical of the many who thought it could make the virus worse.

ResultsPlus
Examiner Tip

Don't ignore the context of the question e.g. the severity of the disease in this situation.

Question 9 (a) (i)

Over half of the candidates failed to score on this question with many leaving this blank, not even attempting to calculate the mean time gained many candidates a mark. Some candidates thought that dividing the Cymosin concentration by the time would give a rate, others attempted an average of the rate for 0.2 and 1.0 and some divided by 9 (the volume of the milk).

All three marks were gained by this response.

9 Chymosin is an enzyme used to clot milk for the production of cheese.

A farmer investigated the effect of chymosin concentration on the rate of milk clotting.

1 cm^3 of a 0.2% chymosin solution was added to 9 cm^3 milk and the time taken for the milk to clot was recorded. This was repeated using five other concentrations of chymosin.

The results are shown in the table.

Chymosin concentration (%)	Time for milk to clot / min		Mean rate of milk clotting / min^{-1}
	Trial 1	Trial 2	
0.2	7.0	7.5	0.14
0.5	3.5	3.0	0.31
1.0	1.5	1.5	0.67
1.5	1.0	1.5	0.80
2.0	0.8	0.7	1.33
3.0	0.5	0.3	2.50

(a) (i) Calculate the mean rate of milk clotting at a chymosin concentration of 0.5%.

(3)

$\frac{3.5 + 3}{2} = 3.25$

$\frac{1}{3.25} = 0.31$

Answer 0.31 min^{-1}

ResultsPlus
Examiner Comments

An example of a correct calculation.

This response gained no marks.

9 Chymosin is an enzyme used to clot milk for the production of cheese.

A farmer investigated the effect of chymosin concentration on the rate of milk clotting.

1 cm^3 of a 0.2% chymosin solution was added to 9 cm^3 milk and the time taken for the milk to clot was recorded. This was repeated using five other concentrations of chymosin.

The results are shown in the table.

Chymosin concentration (%)	Time for milk to clot / min		Mean rate of milk clotting / min^{-1}
	Trial 1	Trial 2	
0.2	7.0	7.5	0.14
0.5	3.5	3.0	0.175
1.0	1.5	1.5	0.67
1.5	1.0	1.5	0.80
2.0	0.8	0.7	1.33
3.0	0.5	0.3	2.50

(a) (i) Calculate the mean rate of milk clotting at a chymosin concentration of 0.5%.

(3)

Answer 0.175 min^{-1}

ResultsPlus
Examiner Comments

The final answer is incorrect and because there is no working shown it is not possible to award any working marks.

ResultsPlus
Examiner Tip

Set out calculations carefully showing each stage of your working in case a mistake is made at the final step.

This response scored one of the three available marks.

9 Chymosin is an enzyme used to clot milk for the production of cheese.

A farmer investigated the effect of chymosin concentration on the rate of milk clotting.

1 cm^3 of a 0.2% chymosin solution was added to 9 cm^3 milk and the time taken for the milk to clot was recorded. This was repeated using five other concentrations of chymosin.

The results are shown in the table.

Chymosin concentration (%)	Time for milk to clot / min		Mean rate of milk clotting / min^{-1}
	Trial 1	Trial 2	
0.2	7.0	7.5	0.14
0.5	3.5	3.0	0.15
1.0	1.5	1.5	0.67
1.5	1.0	1.5	0.80
2.0	0.8	0.7	1.33
3.0	0.5	0.3	2.50

(a) (i) Calculate the mean rate of milk clotting at a chymosin concentration of 0.5%. **(3)**

$\frac{3.5 + 3}{2} = 3.25$ minutes.

$\frac{0.3}{3.25} = 0.154$

Answer 0.15 min^{-1}

ResultsPlus
Examiner Comments

The mean time has been calculated correctly but they have used the Chymosin concentration in the calculation of the rate.

This response scored two of the three available marks.

9 Chymosin is an enzyme used to clot milk for the production of cheese.

A farmer investigated the effect of chymosin concentration on the rate of milk clotting.

1 cm^3 of a 0.2% chymosin solution was added to 9 cm^3 milk and the time taken for the milk to clot was recorded. This was repeated using five other concentrations of chymosin.

The results are shown in the table.

Chymosin concentration (%)	Time for milk to clot / min		Mean rate of milk clotting / min^{-1}
	Trial 1	Trial 2	
0.2	7.0	7.5	0.14
0.5	3.5	3.0	
1.0	1.5	1.5	0.67
1.5	1.0	1.5	0.80
2.0	0.8	0.7	1.33
3.0	0.5	0.3	2.50

(a) (i) Calculate the mean rate of milk clotting at a chymosin concentration of 0.5%.

3·5 + 3 = 6·5, 6·5 ÷ 2 = 3·25 mins. (3)

$\frac{1}{3 \cdot 25} = 0 \cdot 307692$

$= 0 \cdot 30$

Answer 0·30 min^{-1}

ResultsPlus
Examiner Comments

This candidate did the correct calculation, but incorrectlly rounded the calculated value down.

ResultsPlus
Examiner Tip

Check rounding of figures carefully.

Question 9 (a) (ii)

Most candidates failed to score any marks on this question.There were a lot of blank responses and the most common answer was to state that there were not enough concentrations or repeats completed. Most credit worthy answers linked to other variables, but few related to the context of the question such as relating to the time that would be needed for a useful yield of cheese or the differences caused by increasing the scale of production.

This response gained the mark.

(ii) Give one reason why the information in the table is insufficient to conclude which concentration of chymosin would be best for cheese production.

(1)

This is because they are based on means, which isn't accurate enough. Also you would need to do a larger scale test.

ResultsPlus
Examiner Comments

A creditworthy example which considers the scale of production.

This response gained the mark

(ii) Give one reason why the information in the table is insufficient to conclude which concentration of chymosin would be best for cheese production.

(1)

Because we do not know the scale of how much cheese is required and at what point it is inefficient to put more chymosin as at some point it would ~~no time~~ not increase the rate of clotting as much.

ResultsPlus
Examiner Comments

An example of a credit worthy response for the context of the question.

This response gained the mark.

(ii) Give one reason why the information in the table is insufficient to conclude which concentration of chymosin would be best for cheese production.

(1)

Temperature was not controlled and since chymosin is an enzyme, this would affect rate of reaction for each of the two trials

ResultsPlus
Examiner Comments

An example of recognition of lack of information about another variable.

This response gained no marks.

(ii) Give one reason why the information in the table is insufficient to conclude which concentration of chymosin would be best for cheese production.

(1)

Only 2 trials were done and the intervals between the concentration are not the same or equivalent to eachother.

ResultsPlus
Examiner Comments

This response illustrates two of the common responses that were not judged to be sufficient for credit in the context of the question.

This response gained the mark.

(ii) Give one reason why the information in the table is insufficient to conclude which concentration of chymosin would be best for cheese production.

(1)

We don't know if the quality of the cheese is based on the velocity of the clotting of the milk, or if it is the exact opposite, and the slower clotted milk produces better cheese.

ResultsPlus
Examiner Comments

An example of a response worth credit as they are considering the context of the question.

Question 9 (b)

Many candidates were able to calculate the cost correctly, although there were still plenty of blank responses. Where mistakes were made they often related to the conversion of the units e.g. dm^3 to cm^3 or pence into pounds.

This response gained both marks.

(b) The chymosin used for the investigation costs 3.6p to treat 100 cm^3 of milk.

Calculate how much it would cost to treat 200 dm^3 milk. (2)

200/100 = 2
2 x 3.6p =

200 dm^3 = 200000 cm^3
(x1000)

200000/100 = 2000
2000 x 3.6 = 7200p
172

Answer £ 72

ResultsPlus
Examiner Comments

An example of a correct calculation of the cost.

This response scored 0.

(b) The chymosin used for the investigation costs 3.6p to treat 100 cm^3 of milk.

Calculate how much it would cost to treat 200 dm^3 milk.

(2)

100 x 20 = 200 dm

3.6 x 20 = 72p

Answer £ 0.72

ResultsPlus
Examiner Comments

An example of a common error in converting the volumes into the same units.

ResultsPlus
Examiner Tip

Take care when converting units.

This response gained no marks.

(b) The chymosin used for the investigation costs 3.6p to treat 100 cm^3 of milk.

Calculate how much it would cost to treat 200 dm^3 milk.

(2)

$100cm^3 \times 100\ cm^3$

$= 1000.00 \times 10$

$= 100000cm^3$ $200000\ cm^3 \times 3.6$

$= 720000.00$

Answer £ 720000.00

ResultsPlus
Examiner Comments

Clearly some issues with converting units in this response.

ResultsPlus
Examiner Tip

Always check that the size of your answer makes sense in the context of the question. This would be a very expensive way to produce any cheese.

Question 9 (c)

The majority of responses to this question were disappointing. Candidates struggled to identify the independent variable, although many did mention using two different types of milk. Many confused the independent variable with wanting to use lots of different concentrations.There were very few suggestions on how to measure an end point, and surprisingly few descriptions of how to control any variables, even temperature and pH which were the most often mentioned variables. Many candidates still used “amounts” instead of something specific such as a volume or mass that could be measured.There were several blank responses indicating that some candidates may have run out of time when completing this paper.

This response gained no marks.

(c) Devise a valid investigation to compare the effect of chymosin on the clotting time of milk from two different breeds of cattle.

(4)

- firstly the independent ~~method~~ variable would be measure which is the different ~~type~~ concentration of chymosin, which will ~~start~~ range from 0.0% to 3.0% up by 0.2% to for example, 0.0, 0.2, 0.4, 0.6, 0.8, 1.0, ...
- The dependent variable will be the enzyme ~~be~~ used which is the ~~ENZ~~ Chymosin.
- In order to keep the investigation reliable I will control the variables. ~~The~~ some of the controlled variables are the ~~temperature~~ concentration, of ~~in~~ Chymosin, the time and the two different breeds of ~~cattle~~ cattle.
- I would repeat my investigation 7 times ~~other~~ so that there ~~was~~ is no anomalies in my findings
- I am going to measure the mean rate
- finally ~~other variable that might~~ other variable that may not be controlled are temperature.

ResultsPlus
Examiner Comments

The dependent and independent variables in this response are incorrect. The control variables are not clear or specific e.g. concentration of chymosin has already been specified as the independent variable with a range of values. What is being repeated is not clear enough for credit.

This response gained all four marks available.

(c) Devise a valid investigation to compare the effect of chymosin on the clotting time of milk from two different breeds of cattle.

(4)

Use one concentration of chymosin, for example 1%. Add $1cm^3$ of milk from the first breed to a cuvette. As soon add $1cm^3$ of 1% chymosin to the cuvette, stir the mixture and take a reading from the colorimeter and start a timer. Take readings every 15 seconds until there is no further change. Repeat the experiment two more times so an average clotting time can be found. Then repeat 3 times with the milk from the other cattle. The volumes of milk, pH and enzyme must be controlled. & Before using the colorimeter, it should be zero zeroed with distilled water.

ResultsPlus
Examiner Comments

Credit was given here for:

- control of a variable - specified concentration of chymosin given;
- attempt to measure the end point using a colorimeter;
- repeats;
- comparing the two sources of milk.

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- read the whole question carefully, including the introduction, to help relate your answer to the context asked. In particular make sure you are answering the question asked;
- use all of the information provided in the question to help you with your answer, e.g. graphs and tables of data including the labelling. If more than one set of data is provided make use of both and see how they are connected and evaluate any differences/limitations in the data provided;
- when asked to explain your answer make sure you have effectively included 'because...'in your response;
- aim to evaluate practical procedures and identify why stages are needed in procedures during your practical work in the AS course;
- set out calculations carefully showing each stage of your working in case a mistake is made at the final step and check that the size of the answer makes sense in the context of the question;
- read your answers back carefully – do they answer the question? Are your answers clear and unambiguous? Have you made at least as many clear points as marks are available?
- don’t leave blanks – try to answer all questions and leave enough time to tackle questions at the end of the paper;
- be specific in your vocabulary avoiding vague terms such as amount and use something measureable such as volume or mass;
- look at the appendix of the specification to familiarise yourself with the command words and the examples of the mathematical calculations you are expected to be able to perform at AS level;
- explore and assess examples of candidate responses from this report to help you understand what makes a good response to different types of question, and exemplify the level of knowledge and understanding expected at AS level in this new specification.

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.