

Principal Examiner's Feedback

October 2016

Pearson Edexcel International
Advanced Level
in Biology (WBI01) Paper 01

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Admin 1 GQ October 2016

Paper Introduction

This paper tested the knowledge and understanding of the two AS topics: 'Lifestyle, health and risk' and 'Genes and health', together with elements of How Science Works. The range of questions provided plenty of opportunity for candidates to demonstrate their grasp of these AS topics. On the whole, candidates coped well with this paper, finding most of the questions straightforward to tackle; indeed, there were very few examples of questions not being attempted at all, with all questions achieving the full spread of marks.

It was pleasing to see how well many candidates could recall several areas of the specification in a good level of detail. It was also very pleasing to see very few candidates losing marks for poor quality of written communication (QWC) with many candidates producing clear answers, set out in a logical style with key biological terms spelt correctly. Some candidates let themselves down by not reading the questions carefully enough, or by providing a response without the detail required at this level. In places candidates gave a description when the question asked for an explanation. Many candidates have clearly made good use of past papers and mark schemes, but it is important for candidates to understand the scientific principles covered in the specification so they can apply them to new contexts and not write a rehearsed answer to a question that has been asked in the past.

WBI01_01_Q01bi

Question Introduction

Many good answers were observed with candidates measuring the widest and narrowest lumen width and calculating a mean value.

However, many candidates failed to find the narrowest and widest diameters and thus did not calculate an acceptable mean value. Many also failed to give a result in mm as required.

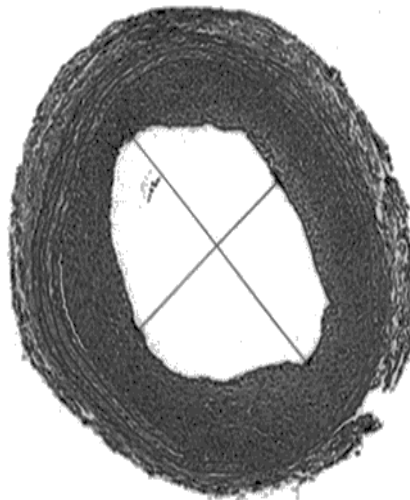
Examiner Comment

In this response the candidate has followed instructions and correctly calculated a mean diameter and has provided the answer in millimetres as required.

Examiner Tip

Make sure you follow the instructions carefully when asked to take and manipulate measurements.

(b) The diagram shows a cross section of an aorta.



Magnification $\times 3$

(i) Measure the maximum and minimum diameters of the lumen.

Use these measurements to calculate a mean value.

$$\text{maximum} = 43 \text{ mm}$$

$$\text{minimum} = 30 \text{ mm}$$

$$\frac{43 + 30}{2}$$

$$= 36.5$$

(1)

Mean diameter 36.5 mm

WBI01_01_Q01bii

Question Introduction

Correct calculation of the area proved difficult for a significant number of candidates. Even though error carried forward was allowed from the mean diameter calculated in (b)(i) many candidates could not calculate a correct area. A value for pi was provided and candidates were expected to use this in their calculation.

Examiner Comment

Although the mean diameter determined in 1(a)(i) was incorrect, the candidate has followed instructions and used the correct method to calculate an area for the lumen. The candidate gained both marks.

Examiner Tip

Remember, if you are required to use the answer to an earlier question in a calculation you will not be penalised twice. This means you can still gain marks in the second calculation for use of the correct method.

(i) Measure the maximum and minimum diameters of the lumen.

Use these measurements to calculate a mean value.

$$\begin{aligned} \text{Max } d &= 16.8 \text{ mm} \\ \text{Min } d &= 12.0 \text{ mm} \end{aligned}$$

$$\begin{aligned} \text{Mean } &= \frac{16.8 + 12.0}{2} \\ &= \frac{28.8}{2} \\ &= 14.4 \text{ mm} \end{aligned}$$

(1)

Mean diameter 14.4 mm

(ii) Use the mean diameter to calculate the area of the lumen, using the formula

$$a = \pi r^2 \text{ where } \pi \text{ is } 3.14$$

$$\begin{aligned} a &= (3.14) \times (7.2)^2 \\ &= 1984.5 - 94 \\ &= 1984.6 \text{ mm}^2 \end{aligned}$$

$$\begin{aligned} r &= 14.4 / 2 \\ r &= 7.2 \text{ mm} \end{aligned}$$

(2)

Area 1984.6 mm²

Examiner Comment

In this response the answer to 1(a)(i) and 1(a)(ii) are both correct.

(i) Measure the maximum and minimum diameters of the lumen.

Use these measurements to calculate a mean value.

$$\begin{array}{r} 43 + 31 \\ \hline 2 \\ \hline = 37 \end{array} \quad \begin{array}{r} 43 + 31 \\ \hline 2 \\ \hline = 37 \text{ mm} \end{array} \quad (1)$$

Mean diameter 37 mm

(ii) Use the mean diameter to calculate the area of the lumen, using the formula

$$\begin{array}{r} r = \frac{37}{2} \\ = 18.5 \end{array} \quad \begin{array}{r} a = \pi r^2 \text{ where } r \text{ is } 18.5 \\ a = \pi \times 18.5^2 \\ = 1074.69 \text{ mm}^2 \end{array} \quad (2)$$

Area 1074.69 mm²

WBI01_01_Q01biii

Question Introduction

The question asks candidates to link structure to function. Many candidates did this well and scored a maximum of three marks. However, a disappointing number of candidates provided good a discription of structure without making a link to function or provided incomplete or confusing descriptions of either structure or function. These candidates often gained no credit for their response.

Examiner Comment

In this response the candidate has not provided complete or valid comparisons. The thick walls are to withstand high blood pressure not to maintain it. The elastic fibres are to allow stretch and recoil, not just recoil. The lumen is a space, it is the endothelial lining of the lumen that is smooth, and it is smooth to reduce friction not maintain a high blood pressure.

Examiner Tip

When explaining how a structure relates to its function you must make valid links between structure and function.

(iii) Explain how the structure of an artery is related to its function.

(3)

Arteries have thick muscular walls with elastic tissue to ~~withstand~~ maintain high blood pressure and the recoil. The lumen is smooth so friction is reduced ~~for the easier~~ to maintain the high blood pressure. The lumen is narrow so the flow of the high blood pressure is smooth.

WBI01_01_Q01c

Question Introduction

The need for a blood circulation system in mammals is a question that has been seen before. Many candidates were able to provide reasonably complete answers gaining the maximum score.

Marking points 1, 3 and 4 were clearly expressed by many candidates. On many occasions marking point 2 was less clearly expressed.

Examiner Comment

In this response the candidate has addressed the question using bullet points. This has allowed the candidate to provide a complete answer that gains all four marking points. Marking points 1 and 4 in the first bullet point, marking point 3 in the second bullet point and marking point 2 in the fourth bullet point.

(c) Explain why mammals need a blood circulation system.

(4)

- low surface area to volume ratio, need a circulatory system to deliver blood to all body cells to overcome limitations of diffusion.
- Heart pumps blood to all body cells under high pressure to provide "Mass flow"
- mammals have high metabolic rate, require constant supply of oxygen and glucose by blood vessels.
- Rich networks of blood capillaries to provide steep concentration gradient, to increase rate of diffusion.
- Glucose is transported in the blood for body cells to carry respiration.

(Total for Question 1 = 13 marks)

WBI01_01_Q02a

Question Introduction

This was a percentage change calculation. The majority of candidates are able to complete these calculations successfully and many scored both marks.

WBI01_01_Q02b

Question Introduction

In this question candidates were asked to describe how a particular set of results might be obtained using a core practical. A number of complete responses were seen and these gained full marks.

Marking point 2 was infrequently seen, candidates ignored the fact that they were asked how a particular set of results were collected often making suggestions such as 'use five different concentrations of permethrin'.

Responses addressing marking point 4 were often poorly expressed e.g. count the beats for 30 seconds was not sufficient. Candidates needed to express how a heart rate could be determined e.g. count the beats for 30 seconds and then multiply by two.

Similarly, for marking point 5 is needed to be clear that the observation at each concentration was repeated. Simply statements such as 'repeat the experiment three times' are not sufficiently clear.

Examiner Comment

In this response the candidate has provided an answer in the context of the question, gaining a maximum of three marks. In particular, in bullet point one the candidate makes reference to the permethrin concentrations from the graph and gains bullet point two. Bullet point three gains marking point 3. Bullet point six gains marking point 5. Either of marking points seven or eight were acceptable for marking point 1.

Examiner Tip

When asked to describe how a set of data might be collected, make sure your answer takes account of all the information provided. In this example to gain marking point 2 candidates had to suggest, using concentrations of permethrin between 0 and 1500 $\mu\text{mol dm}^{-3}$, information gathered from the graph.

DO NOT WRITE IN THIS AREA

(b) Describe how an experiment could be carried out to obtain these results. (3)

- ① prepare solutions containing different concentration of permethrin from 0 to 1500 $\mu\text{mol dm}^{-3}$ (0, 40, 100, 300, 1500 $\mu\text{mol dm}^{-3}$)
- ② put a 1 daphnia on a cavity slide and put one drop of solution containing 40 $\mu\text{mol dm}^{-3}$ permethrin on it.
- ③ put the cavity slide under a light microscope and focus to find its heart beat.
- ④ Draw a dot for one beat and count the total number of beats in 30 seconds.
- ⑤ Continue experiment with other concentration solutions.
- ⑥ Repeat for 3 times at each concentration and calculate mean.
- ⑦ use daphnia of same size and species
- ⑧ keep temperature the same and pH of solution same.

WRITE IN THIS AREA

WBI01_01_Q02c

Question Introduction

Marking point 1 was available because Permethrin is used to kill invertebrates (insects) and Daphnia are invertebrates. Relatively few candidates gained this marking point. Many candidates suggested that invertebrates do not have a nervous system, this was not accepted for marking point 3. Daphnia have a simple or less well developed nervous system.

Examiner Comment

This candidate has gained one mark (marking point 2) for Daphnia being transparent. The second mark was not awarded since Daphnia do have a simple nervous system.

J 'heart' 'beat' for 'reliability' J

(c) Suggest **two** reasons why *Daphnia* were used in this investigation. (2)

1 Daphnia is transparent so the heart will be easily visible.

2 Daphnia is abundant in nature. has no nervous system and cannot feel the pain.

(Total for Question 2 = 7 marks)

In this example the candidate gained both marks. One mark for Daphnia being transparent and a second mark for the converse of marking point 3, Daphnia having a simple nervous system and not feeling pain.

(c) Suggest **two** reasons why *Daphnia* were used in this investigation. (2)

1 Daphnia has a transparent body so that the heart can be easily observed

2 Daphnia has a simple nervous system so it might not feel alot of pain.

(Total for Question 2 = 7 marks)

WBI01_01_Q03ai

Question Introduction

Candidates who looked at all the information provided generally scored well on this question. Those candidates that did not score well either failed to make a proper comparison or stated genetic differences. Marking point 1 was infrequently seen. Simply stating they had a different diet was not sufficient for marking point 2. The preferred response being an increased calorie intake.

Examiner Comment

This is an example of a clearly expressed response in which the candidate has made valid comparisons between the two groups and has gained marking points 2 and 3.

3 Obesity is a risk factor in the development of cardiovascular disease (CVD).

(a) Pima Indians living in Arizona are genetically very similar to those living in Mexico.

The table below shows the frequency of obesity in Pima Indians in these two locations.

Location of Pima Indians	Frequency of obesity (%)
Arizona	30
Mexico	13

(i) Suggest why there is a higher frequency of obesity in Pima Indians living in Arizona than in Pima Indians living in Mexico.

(2)

In Arizona Pima Indians might be less active than people in Mexico so that increases the frequency of obesity. Also in Arizona the people might eat foods with much more saturated fats and lipids than people in Mexico. That might increase frequency of obesity.

Examiner Comment

In this response the candidate has suggested a difference in smoking habits between the two groups. There is no reason to think this might result in a difference in obesity and no credit was gained for this suggestion. The candidate then went on to attempt to describe a difference in diet. However, the response did not make a clear comparison in terms of food intake and marking point 2 could not be awarded.

Examiner Tip

Always read questions carefully. Do not rush to answer a question without first understanding what you are being asked to do.

3 Obesity is a risk factor in the development of cardiovascular disease (CVD).

(a) Pima Indians living in Arizona are genetically very similar to those living in Mexico.

The table below shows the frequency of obesity in Pima Indians in these two locations.

Location of Pima Indians	Frequency of obesity (%)
Arizona	30
Mexico	13

(i) Suggest why there is a higher frequency of obesity in Pima Indians living in Arizona than in Pima Indians living in Mexico.

(2)

Pima Indians living in Arizona may smoke more frequently and having a unbalanced diet compared to Pima Indians living in Mexico who doesn't smoke much and having a better diet.

WBI01_01_Q03aii

Question Introduction

The majority of candidates were able to provide two risk factors other than obesity or genetic factors and gained both marks. Gender was considered to be genetically determined in the context of this question and was ignored.

WBI01_01_Q03ci

Question Introduction

A great many candidates were able to gain the first marking point for a description of the general trend. However, the majority were unable to go on and clearly express the idea that men are more affected than women, marking point 2. Very few candidates made any meaningful use of the data for marking point 3.

Examiner Comment

In this response the candidate has clearly identified the general trend of increased CVD with increased BMI (marking point 1). However, the candidate has made no reference to the difference between men and women so did not gain marking point 2.

(i) Using the information in the graph, describe the relationship between body mass index and the incidence of CVD. (2)

There is a correlation between body mass index and incidence of CVD as ~~body~~ incidence of CVD increases as body mass increases

Examiner Comment

In this response the candidate gains marking points 1 and 2 for a good description of the relationship between BMI and CVD. The last two lines would not be sufficient for the correct use of figures mark. This is because the candidate did not relate the change in CVD incidence to the change in BMI. For example, 'an increase in CVD in men of 140 per 1000 (265-125) from healthy to obese BMI groups' would have been sufficient for marking point 3.

Examiner Tip

When you manipulate data. Credit will be given if the manipulation is relevant to the question and complete. In this example: 'in men : 140 increase' makes no sense and gains no credit.

- (i) Using the information in the graph, describe the relationship between body mass index and the incidence of CVD.

(2)

As the BMI increases, the incidence of CVD increases. However the increase of incidence of CVD in men is greater than in women.

~~#~~ in men: $265 - 125 = 140$ increase

in women: $125 - 105 = 20$ increase

WBI01_01_Q03cii

Question Introduction

Many candidates did not appear to know how to answer this question. Candidates were told at the start of part (b) that BMI is used to identify obese or overweight individuals.

Credit was given for responses that then explain why BMI is used to do this. Namely since weight is related in part to height using BMI takes account of height controls for height.

Examiner Comment

In this response the candidate has started to provide an acceptable response. The candidate has identified that BMI takes account of height and mass (marking point 2). To gain a second mark the candidate could then have explained that height has an impact on body mass (marking point 1) or that using BMI controls for height (marking point 3).

(ii) Suggest why BMI was used in this study.

(2)

BMI helps to quantify the body mass and height and will help to acquire a clear point in data to evaluate the situation.

WBI01_01_Q03ciii

Question Introduction

A disappointing number of candidates appear not to know the reason for expressing risk in this way.

Examiner Comment

Data on disease incidence or rates are often quoted for a set population size. The reason is to allow comparisons to be easily made. This candidate has provided an answer that is just sufficient.

incidence per population not just weight

(iii) Suggest why CVD is expressed as incidence per 1000. (1)

To compute values more easily /

~~gives it~~

(Total for Question 3 = 10 marks)

WBI01_01_Q04b

Question Introduction

In general candidates answered this question well. The most frequent reasons for not gaining marks included using a variety of letters to represent alleles, marking points 1 and 2.

Unclear 'birds nest' genetic diagram, marking point 2 and giving the probability of the homozygous recessive genotype, marking point 3.

Examiner Comment

In this example the candidate has gained two marks (Marking point 1 and 2). The candidate has not completed the answer by giving a correct probability of the offspring being heterozygous for the condition and does not gain marking point 3.

(b) Using a genetic diagram, determine the probability that individual H is heterozygous for PKD. (3)

~~P~~
genotype

E F

D d Dd

F₁ Generation

	D	d	
D	DD	Dd	3 : 1
d	Dd	dd	

Probability

Examiner Comment

This candidate has produced a complete answer and gained all three marks. The provision of a key for the alleles and a clear explanation of how the probability of being a heterozygote is calculated demonstrate a good understanding of this topic.

(b) Using a genetic diagram, determine the probability that individual H is heterozygous for PKD. (3)

Let P be the dominant allele
 Let p be the recessive harmful allele

♀ Gametes Pp and Pp

	P	p
P	PP	Pp
p	Pp	pp

2 x Pp ∴ 50%
 chance of
 H being
 heterozygous for
 PKD

Probability 50%.

WBI01_01_Q04ci

Question Introduction

Most candidates were able to identify a suitable test, although a small number incorrectly suggested pre-implantation genetic testing.

For marking point 2 the source of the sample had to be clearly identified.

Examiner Comment

This response gained two marks, marking points 1 and 2. There was not sufficient detail for marking point 4 and no attempt at marking points 3 or 5.

*

(c) Individual **F** is pregnant.

Prenatal testing can be used to determine if her fetus will develop PKD.

(i) Describe **one** named method of collecting cells for pre-natal testing. (4)

Method Amniocentesis

How this method is carried out Amniotic fluid from the
water is taken out using a fine needle.
This contains fetal cells which contain
DNA that can be ~~test~~ analyzed to
see if there is an allele that would cause
the genetic disorder of PKD

Examiner Comment

This response gained three marks for marking points 1, 2 and 3. Again, there was not sufficient detail for award of either marking point 4 or 5.

(c) Individual **F** is pregnant.

Prenatal testing can be used to determine if her fetus will develop PKD.

(i) Describe **one** named method of collecting cells for pre-natal testing. (4)

Method Amniocentesis.

How this method is carried out Amniocentesis is carried out
at 15-16 weeks of the pregnancy. A fine
needle is used to enter the amniotic sac
and the needle takes ⁱⁿ ~~of~~ amniotic fluid which
contains fetal cells. These fetal cells are
analysed and can be ~~be~~ checked to see if
it has any disease in this case PKD

WBI01_01_Q04cii

Question Introduction

Most candidates suggested two suitable issues and gained both available marks.

WBI01_01_Q05a

Question Introduction

Many candidates were able to explain what the term fluid mosaic means. A disappointing number of candidates did not answer the question.

Instead they simply described how a lipid bilayer forms.

Examiner Comment

This candidate has clearly expressed the idea that mosaic refers to the randomly scattered appearance of proteins. However, the first part of the response describes molecules as moving without clearly identifying these molecules as phospholipids and marking point 2 was not awarded.

5 Cell membranes control the movement of materials into and out of cells.

(a) The fluid mosaic model can be used to explain the properties of a cell membrane.

Explain what is meant by the term **fluid mosaic**.

The term 'fluid' means that the molecules can move within the cell membrane. (1/along) (2)

The term 'mosaic' means that the molecules like protein or cholesterol is inserted randomly in the phospholipid layer.

Examiner Comment

In this response both ideas, 'fluid' and 'mosaic', are clearly addressed and the response gained both marks.

5 Cell membranes control the movement of materials into and out of cells.

(a) The fluid mosaic model can be used to explain the properties of a cell membrane.

Explain what is meant by the term **fluid mosaic**.

(2)

Fluid means that the phospholipids move around within its bilayer constantly and mosaic means that proteins are randomly distributed and ~~scattered~~ dotted around within the membrane.

WBI01_01_Q05ci

Question Introduction

Most candidates were able to state that 'partially permeable' means that only some substances can cross the membrane.

Few went on to explain that these materials cross the membrane by diffusion.

Examiner Comment

In this response the candidate has explained the term partially permeable and was awarded both marks.

(i) The tubes were made from a partially permeable membrane.

Explain what is meant by the term **partially permeable**.

(2)

Partially permeable means that substances can pass through the membrane ^{by diffusion}, but only ~~in~~ some of the substances, not all can pass through.

WBI01_01_Q05cii

Question Introduction

Some candidates were able to provide good explanations for the observed results.

Many however, simply described the results gaining no marks.

A number of candidates misinterpreted the data and suggested that the change in mass was due to sodium chloride moving into the tube.

Examiner Comment

In this response the candidate has provided a good answer. Lines one to three, gain marking point 1. In line four marking points 3 and 4 were awarded. Lines five and six were considered to be just sufficient for marking point 5. Although it would have been better if the candidate had clearly identified the concentrations as solute concentrations.

Examiner Tip

With extended answers check what you have written and make sure your response is clear and unambiguous. In this example the candidate makes the statement 'until the concentrations inside and outside become equal'. It is not entirely clear which concentrations the candidate is referring to. On this occasion the examiner was able to give the mark based on the earlier part of the response. However, this will often not be the case.

(ii) Explain the change in mass of the 20% sodium chloride tube during this experiment.

(4)

As the concentration of sodium chloride was greater in the tube than outside, the concentration of water becomes greater outside than inside. Therefore a concentration gradient is established. Water therefore moves by osmosis into the tube until the concentrations inside and outside become level which happens at 25 minutes.

WBI01_01_Q05ciii

Question Introduction

Many candidates suggested correctly that there shouldn't be any change in mass, marking point 3.

However, few candidates then went on to try to explain why the mass might change slightly and gain a second mark (marking point 1 or 2).

Examiner Comment

This response gained marking point 3 for recognising that the concentration should not change.

(iii) Suggest an explanation for the changes in the mass of the 0.9% sodium chloride tube during this experiment. (2)

The mass of 0.9% sodium chloride tube has no significant change because there concentration inside and outside is similar. Therefore the movement of substance and water molecules is at equilibrium. Therefore no significant change.

(Total for Question 5 = 11 marks)

WBI01_01_Q06a

Question Introduction

This question proved straightforward for most candidates. A small number however, confused amino acids and bases, describing a mutation as a change in the amino acid sequence.

Examiner Comment

This response gained the mark for the first line. Lines two and three were ignored, however, it is worth remembering that not all mutations will result in changes in mRNA or in the proteins produced.

6 Cystic fibrosis is a genetic condition caused by mutations in the CFTR gene.

(a) State what is meant by the term **mutation**.

(1)

A change in the sequence of bases in a DNA molecule
which leads to a change in the mRNA sequence
so a different protein is produced.

WBI01_01_Q06bi

Question Introduction

This question proved to be discriminating, with most candidates gaining some marks but relatively few gaining all five available marks. Relatively few candidates addressed how a type III mutation might affect the CFTR protein (marking points 1 and 2). A significant number of candidates gave irrelevant answers focussed on cilia not being able to move thick mucus and an increased risk of respiratory infections.

Examiner Comment

In this response, marking point 3 was given for lines 1 to 3. Marking point 5 was then awarded on line 4 and marking point 6 for lines 4 and 5.

Examiner Tip

With an extended response question such as this one, make sure you give a complete answer.

In this question the answer should start with an explanation as to how the mutation type III might affect the CFTR protein and then how this affects the movement of water. The answer should then finish with an explanation as to how gas exchange is reduced.

(b) Cystic fibrosis can be classified according to the effect of different gene mutations on the CFTR protein.

The table below shows three different mutations and their effects on the CFTR protein.

Mutation	Effect on the CFTR protein
I	no CFTR protein is made
III	non-functioning CFTR protein is present in the cell membrane in normal quantities
V	functioning CFTR protein is present in the cell membrane in reduced quantities

(i) Explain how **mutation III** results in reduced gas exchange in people with cystic fibrosis.

(4)

If the CFTR protein does not function then chloride ions cannot leave the cell and sodium ions are not inhibited and so sodium and chloride are found within the cells. This results in a thick and sticky mucus. The thick mucus blocks the bronchioles and reduces the surface area of the alveoli in contact with air and oxygen. The person does not get sufficient oxygen supply. The thick mucus cannot be moved by the cilia and increases the risk of infections.

WBI01_01_Q06bii

Question Introduction

Many good responses were seen for this question. Incomplete responses were frequently provided for marking points 1 and 5.

Sometimes the enzyme was mentioned without the process, but more frequently the process was described without the enzyme.

A significant number of candidates described translation rather than transcription, gaining no marks.

Examiner Comment

A good description of translation was provided by the candidate. However, the question was about transcription and no marks were awarded.

Examiner Tip

Always read questions carefully and then answer the question asked.

(ii) The CFTR gene is transcribed in people with mutation III and mutation V.

Describe how the CFTR gene is transcribed.

(3)

The mRNA comes out of nucleus into the cytoplasm and attaches on the surface of the ribosomes. ~~then~~ Then tRNA picks up the necessary amino acids required from the cytoplasm. The tRNA with ~~3~~ base a codon attaches to the mRNA by complementary base pairing. And this also happens with the next codon. And the amino acids on these tRNA's are joined together peptide bonds between them and then the tRNA leaves, leaving the amino acid behind.

Examiner Comment

This response gained a maximum of three marks. Marking point 1 was awarded for lines one to two. Marking point 2 was awarded for lines three to five. Marking point 3 was awarded on line four and marking point 4 could be awarded for lines four to six.

(ii) The CFTR gene is transcribed in people with mutation III and mutation V.

Describe how the CFTR gene is transcribed.

(3)

The CFTR gene unwinds by breaking of hydrogen bonds by enzyme helicase so one of the DNA strands will act as a template 'antisense strands'. RNA nucleotides will binds to the DNA nucleotides by complementary base ~~pair~~ pairing so a RNA molecule will ~~be made~~ detach from the nucleus and will be transmitted to the cytoplasm for translation.

WBI01_01_Q06c

Question Introduction

Many good answers were seen for this question. To gain marking point 1 candidates needed to refer to the CFTR gene. Simple statements such as isolate the normal gene were not sufficient.

For marking point 4 the method of delivery needed to be appropriate to the cystic fibrosis, so descriptions of injecting the vector were ignored.

Examiner Comment

This response gained all three available marking points. Marking point 1 in line 2, marking point 2 lines two and three, and marking point 3 in line one. Injection of virus would not have been accepted for marking point 4.

(c) Suggest how somatic gene therapy could be used to treat people with cystic fibrosis.

(3)

Virus could be used a vector and a normal normal gene for CFTR protein is inserted into virus to be introduced into the lung cells through injection of virus into lung cells therefore normal gene will be translated and transcribed and normal CFTR protein will be produced - The treatment need to be repeated

(Total for Question 6 = 11 marks)

WBI01_01_Q07a

Question Introduction

This was a challenging question and proved to be discriminating.

However, a pleasing number of candidates grasped the idea and provided good responses. Candidates who addressed both clotting and the consequence of clotting found it easier to gain all available marks.

Examiner Comment

This response was awarded a maximum of five marks. Marking point 3 was awarded in line two. Marking points 1 and 2 are available from three and four. Marking points 4 and 5 are available from lines five to nine. Marking point 6 is a just about available from lines ten and eleven. Marking point 7 is available from lines eleven and twelve.

Examiner Tip

In this response marking points 1, 2 and 6 could have been awarded. Even so, the candidate's response with respect to these marking points, could have been expressed more clearly.

7 Thrombophilia can be caused by major surgery. The blood of a person with thrombophilia has an increased tendency to clot.

*(a) Suggest how major surgery could cause thrombophilia and why this might be a dangerous complication after surgery.

(5)

Major surgery could cause thrombophilia as it could increase amount of thromboplastin. This is dangerous because when there is thromboplastin - originally released by platelet when endothelial cells are damaged - it converts prothrombin to thrombin, in presence of calcium ions (Ca^{2+}). Thrombin then catalyses the reaction of fibrinogen to fibrin which forms a mesh of fibres. This mesh accumulates more platelets and white blood cells forming a clot. The clot formed would be unnecessary as no damage had initially been caused. But as clot forms, it may ~~block~~ block blood flow or prevent oxygen from reaching that part of the body. Also if clots begin to form, endothelial cells can get damaged and internal bleeding may also take place. Clots formed can cause CVDs, heart attacks and even strokes.

Examiner Comment

In the first part of the response the candidate correctly describes the relationship between METHRO II and clotting (thrombophilia). However, they then carry on and contradict themselves, incorrectly describing the relationship as a positive correlation. Unfortunately no credit could be given.

Examiner Tip

Carefully check your answers to make sure you do not contradict yourself.

Some results from the trial are shown in the table below.

Dose of METHRO II / a.u.	Percentage of patients (%)	
	With serious clotting	With excessive bleeding
1.0	37.8	0.8
1.5	24.1	1.2
2.3	23.7	3.5
3.0	15.1	5.5

(i) Describe the effect of METHRO II on thrombophilia.

(1)

As the dose of Methro II increased, the clotting decreased but the bleeding increased. so positive correlation between Methro II and thrombophilia.

Examiner Comment

This is a straightforward response that gains the mark.

Dose of METHRO II / a.u.	Percentage of patients (%)	
	With serious clotting	With excessive bleeding
1.0	37.8	0.8
1.5	24.1	1.2
2.3	23.7	3.5
3.0	15.1	5.5

(i) Describe the effect of METHRO II on thrombophilia.

(1)

AS METHRO II increases, the thrombophilia decreases

WBI01_01_Q07bii

Question Introduction

Many candidates appear to have found this question difficult, with relatively few candidates gaining both available marks.

A number of candidates gained one mark for the idea that the selected dose is a compromise (additional guidance) rather than actually explain why it is a compromise marking points 1 and 2.

Examiner Comment

In this response the candidate expresses the idea that 1.5 is a compromise dose and gains one mark as described in the mark scheme additional guidance. No comparison is made to the effects of higher doses. So marking points 1 or 2 could not be awarded.

(ii) Using the information in the table, suggest why a dose of 1.5 a.u. of METHRO II should be given to patients undergoing major surgery.

(2)

That's because that dose reduces the clotting significantly from 37.8 to 24.1, and also it will not cause a lot of excessive bleeding just a little bit as shown from 0.2 to 1.2.

Examiner Comment

In this response the candidate clearly identifies why the preferred dose of METHROII is 1.5, gaining both marking points 1 and 2.

(ii) Using the information in the table, suggest why a dose of 1.5 a.u. of METHRO II should be given to patients undergoing major surgery.

(2)

As ^{shown} clotting decreases not the patients given 1.0 a.u. of METHRO II.

Also, as the dose increases up to 1.5 a.u. there is a moderate amount of ~~and~~ excessive bleeding. However, when dose of 2.3 a.u. is used, there is

a small difference of serious clotting reducing, 0.4 ~~more~~ than the dose 1.5 a.u.

but there is a great increase of excessive bleeding by 2.34. As major

surgeries patients will lose a lot of blood so a dose of 1.5 a.u. is perfect for both reducing serious clotting and excessive bleeding.

(Total for Question 7 = 8 marks)

Examiner Comment

In this response the candidate clearly expresses the idea that higher or lower doses have adverse consequences and the impact of this

(iii) Using the information in the table, suggest why a dose of 1.5 a.u. of METHRO II should be given to patients undergoing major surgery: (2)

It decreased the percentage of blood clotting with a little increase in excessive bleeding.

Compared to other doses, this is more effective as, higher doses decrease the blood clotting and increases the bleeding percentage.

In lower doses, blood clotting is high and bleeding is less so less effective

(Total for Question 7 = 8 marks)

WBI01_01_Q08b

Question Introduction

A disappointing number of candidates appear to have no idea why the genetic code is a triplet code.

In this response the candidate demonstrates an understanding of the need for a triplet code. Marking points 2 and 3 were awarded. Unfortunately, the candidate did not make reference to their being only four bases used in DNA and marking point 1 could not be awarded.

(b) The genetic code is a triplet code.

Explain why a triplet code is required for the synthesis of protein.

(3)

Triplet in the mRNA are referred to as codons. They code for specific amino acids and they are identified by the tRNA which transports the relevant amino acid by using its anticodon. A triplet code is required as humans have 20 essential amino acids and a double code can only code for 16, hence a triplet code is used.

Examiner Comment

This is an example of an excellent response gained all three available marks.

(b) The genetic code is a triplet code.

Explain why a triplet code is required for the synthesis of protein.

(3)

There are ~~20~~ ⁴ different types of ^{bases} ~~amino acids~~. If genetic code is singlet, there can only be 4 types of code; thymine, adenine, guanine, cytosine. If genetic code is duplet, $4^2 = 16$; so 16 codes are formed. But there are 20 types of amino acids. So the genetic ~~code~~ code must be a triplet code so that 64 codes are there for amino acids. Few ^{genetic} codes can code for one ~~amino acid~~ amino acid. This reduces mutation rate in the synthesis of protein. ~~and~~ For example, ^{amino acid} ~~cytosine~~ cysteine can be coded by 3 codes.

WBI01_01_Q08c

Question Introduction

It was evident that many candidates were aware of the Meselson and Stahl experiment. Generally candidates were able to say that the results of the experiment supported semiconservative replication.

However, most candidates struggled to describe how Meselson and Stahl's results supported semiconservative replication.

Examiner Comment

In this response the candidate demonstrates a good understanding of Meselson and Stahl's experiment.

Marking point 2 was seen in line four, marking point 3 in line six, marking point 4 in line seven, marking point 5 in line eight, marking point 6 in lines 9 to eleven and marking point 7 in the last two lines.

* (c) Explain how Meselson and Stahl's experiment provides evidence for the accepted theory for the replication of DNA.

(5)

DNA replicates by semi-conservative theory. It states that the newly synthesised DNA has one old strand (original strand) and one new strand. This is proven right by centrifuge experiment.

Bacteria were grown in medium only containing ^{15}N and allowed to reproduce once. ~~They were centrifuged~~ Their DNA were taken out and centrifuged.

The result was that the heavy band of ^{15}N formed in the centrifuge. Bacteria are then moved to medium containing ^{14}N and DNA centrifuged after 1 reproduction period. It shows middle band. Bacteria were again placed in ^{14}N medium and allowed to reproduce once more. When it was centrifuged, the band appeared in the middle and on the top (light band). This proves semi-conservative method of DNA replication.

(Total for Question 8 = 10 marks)

Paper Summary

Many candidates have clearly made good use of past papers and mark schemes, but it is important for candidates to understand the scientific principles covered in the specification so they can apply them to new contexts and not write a rehearsed answer to a question that has been asked in the past.

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 used. You should read the question through carefully at least once and then write down your knowledge and understanding in a way that answers the question.
- Make sure you understand what the command words e.g. describe, explain and suggest mean.
- Make sure you understand the biochemistry that underpins the concepts covered in this unit.
- Read questions carefully, do not assume that the question asked is the same as that which has appeared on a previous paper.
- Read your answers back carefully – do they answer the question, have you made at least as many clear points as marks are available?
- When asked to distinguish between two things make sure your answer is comparative and mentions both things being compared.
- When asked to describe a trend this is asking for the overall changes and not a detailed description of individual points on a graph or in a table.
- Include a relevant calculation whenever you are asked to describe or compare numerical data in tables or graphs
- Don't be afraid to include a sketch diagram or graph if it will help add clarity to your answer.
- When describing the measurement or control of variables, be specific about what is to be measured e.g. volume or mass, and avoid vague terms such as amount.
- Pay particular attention to spelling, the use of technical names and terms, and organisation of your answer in QWC labelled extended writing questions.
- Explore and assess examples of candidate responses from this report to help you understand what makes a good response to different types of questions, and exemplify the level of knowledge and understanding expected at AS level.

