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Examiners' Report
June 2023

Int GCSE Human Biology 4HB1 01

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June 2023

Publications Code 4HB1_01_2306_ER

Introduction

This paper elicited a wide range of responses providing opportunities for candidates to demonstrate their knowledge and understanding of Human Biology.

Candidates continue to experience issues with calculations that are set. The specification demands that there will be a minimum of 10% of the marks allocated to calculations which is a minimum of nine marks per paper. Candidates often failed to show their working which is essential as they run the risk of penalising themselves if it is not clear what their thought processes are.

The quality of graph plotting was particularly disappointing. Candidates should always attend examinations in Human Biology with a ruler and a sharp pencil. Straight lines cannot be drawn effectively without the use of a ruler or its equivalent. Points cannot be plotted accurately without the use of a sharp pencil. A sharp pencil is required if diagrams are going to be drawn showing the degree of clarity that is required at this level.

Candidates should also be encouraged to write in sentences using the correct terminology and in particular they need to focus on the practical aspects of the specification.

Question 1

This question was generally well answered. The commonest error was that candidates used the word 'along' instead of 'down' and 'down' instead of 'against'.

Question 2 (a)(i)

Many candidates omitted to mention the mouth or the nose as the first entry point for air. A number of candidates thought that the air passed down the oesophagus but this was generally well answered by most candidates, even though the spelling of bronchi and bronchioles left much to be desired on occasions.

Question 2 (a)(ii)

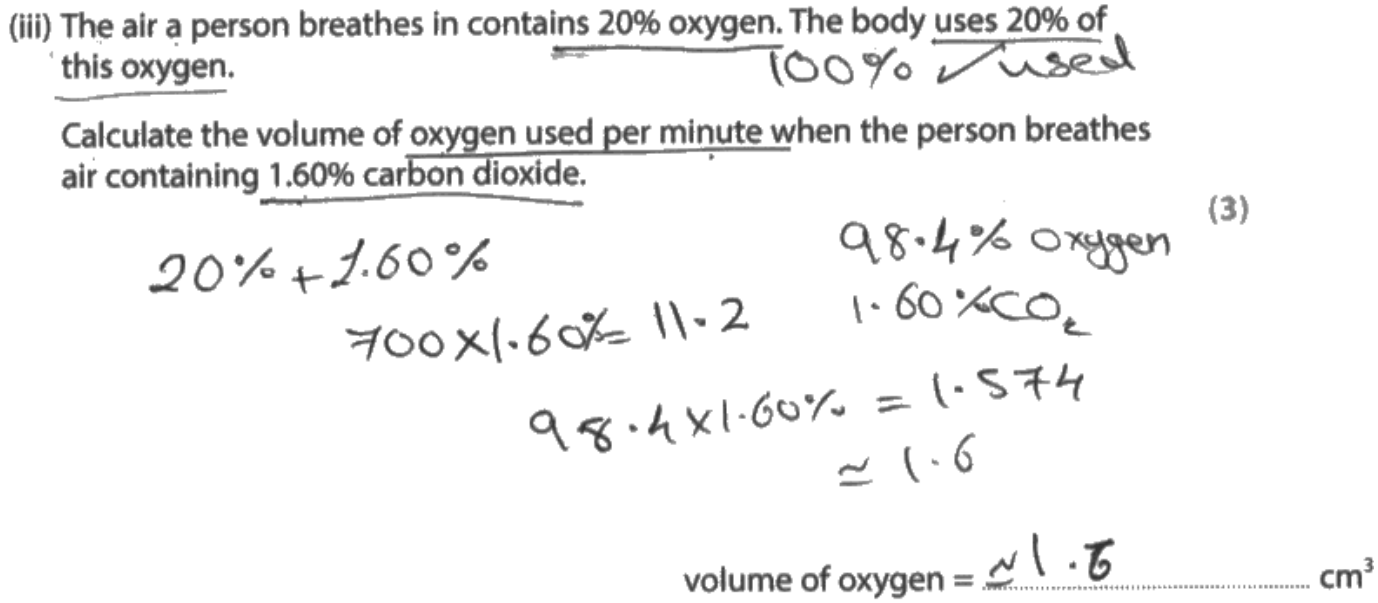
Whilst the ideas that the alveoli had a large surface area, other features shown in the diagram were not as well interpreted. Many candidates talked about a surface area to volume ratio which was not appropriate in this case. A significant number described the role of blood capillaries even though they are not shown in the photomicrograph. A common mistake was to suggest that there was a 'thin membrane' rather than a thin wall, though some candidates mentioned cell wall which is clearly incorrect.

Question 2 (b)(ii)

Many candidates scored maximum marks but sometimes failed to divide by 1000 to convert to dm^3.

Question 2 (b)(iii)

Candidates found this a challenging question and often failed to demonstrate any understanding of the stages involved. A common failure was that candidates did not set out their working so it was impossible to tell how they reached their final answer.


(iii) The air a person breathes in contains 20% oxygen. The body uses 20% of this oxygen.

100% used

Calculate the volume of oxygen used per minute when the person breathes air containing 1.60% carbon dioxide.

(3)

20% + 1.60%

700 x 1.60% = 11.2

98.4% oxygen

1.60% CO_2

98.4 x 1.60% = 1.574

≃ 1.6

volume of oxygen = ≃1.6 ..... cm^3

ResultsPlus
Examiner Comments

This candidate has not understood the processes involved in reaching a correct final answer.

ResultsPlus
Examiner Tip

State clearly what each stage is calculating.

(iii) The air a person breathes in contains 20% oxygen. The body uses 20% of this oxygen.

Calculate the volume of oxygen used per minute when the person breathes air containing 1.60% carbon dioxide.

(3)

$700\,cm^3 \times 15$

$= 10,500\,cm^3 \times 20\%$

$= 2100\,cm^3 \times 20\%$

$= 420\,cm^3$

volume of oxygen = 420 cm^3

ResultsPlus
Examiner Comments

This is a clear answer with each stage in the calculation set down.

ResultsPlus
Examiner Tip

Always set out stages in a multistage calculation.

Question 2 (b)(iv)

Candidates found this question difficult and focussed on oxygen shortage and demand rather that the issues with carbon dioxide. The context of the question is clearly related to carbon dioxide and this should be a clue to any answers given. Most candidates simply scored a mark with a correct reference to increased tidal flow/volume or rate of breathing increases.

(iv) Explain the effect of increasing the percentage of carbon dioxide in the air a person breathes in on the tidal volume and rate of breathing.

(4)

as The percentage of carbon dioxide inhaled increase The tidal volume and breathing rate increases as chemoreceptors in aorta detect The change in pH (co2 makes pH low) and sends nerve impulses to Ventilation center, ~~increase breathing rate and volume of air inhaled~~ which stimulates lungs and increase breathing rate and increase volume of air inhaled

ResultsPlus
Examiner Comments

This is a typical example with a reference to changes in rate of breathing. This candidate has added a little extra with a reference to chemoreceptors.

ResultsPlus
Examiner Tip

Look at the context of the question.

(iv) Explain the effect of increasing the percentage of carbon dioxide in the air a person breathes in on the tidal volume and rate of breathing.

(4)

If you increase the percentage of ~~tidal volume~~ Carbon dioxide the tidal volume will increase because ~~you are trying to breathe in as much oxygen as possible but if the carbon dioxide is increased~~ tidal volume is trying too see how much oxygen you can intake in a breath and you can't if their is an increase in CO_2. Rate of breathing will increase because you are breathing more because you are not getting enough oxygen.

ResultsPlus
Examiner Comments

There is just a reference to increasing the rate of breathing for one mark. The candidate tends to have a focus on increasing the intake of oxygen which is not the context of the question.

ResultsPlus
Examiner Tip

Be aware of the context of the question.

(iv) Explain the effect of increasing the percentage of carbon dioxide in the air a person breathes in on the tidal volume and rate of breathing.

(4)

On increasing percentage carbon dioxide in air tidal volume and Rate of breathing increases, this is because on inhalation higher volume of carbon dioxide is inhaled and carbondioxide lowers blood pH, this is detected by brain and brain sends signals for lungs to increase breathing rate and tidal volume, to allow faster and more efficient excreation of Carbondioxide outside the body on exhalation

ResultsPlus
Examiner Comments

This is quite a good response which references an increase in the rate of breathing but also refers to an increase in the volume of carbon dioxide in the blood and the need to remove it. It is a pity that there was no reference to chemoreceptors detecting the higher levels of carbon dioxide in the blood.

ResultsPlus
Examiner Tip

Keep answers relevant and don't use a scatter gun approach.

Question 3 (a)(i)

Whilst the majority of candidates identified a correct label for the X axis, very few could put the correct scale ie 0-10, 11-20, 21-30 etc.

Question 3 (a)(ii)

This was generally well answered particularly with the tolerance of plus/minus two for each component reading. A minority of candidates just put one figure, usually 65 which is the volume given off between 21-30 minutes.

Question 3 (a)(iii)

Candidates find this type of question challenging. An overall view of what is happening is required and where there are differences these need to be described.

(iii) Describe the trend shown by the results.

(3)

- the more the time, the less the volume of gas produced in cm^3
- non-linear decrease
- after 50 minutes the volume of gas produced almost decreased to half and it continued to decrease at 60 minutes

ResultsPlus
Examiner Comments

This candidate scored only one mark for a correct reference to the trend of decreasing gas production during the investigation. The candidate nearly scored a second mark with the comment about the gas production decreasing by half after 50 minutes but the correct trend description was that gas production dropped a lot or that little was produced.

ResultsPlus
Examiner Tip

Take an overview in this type of question.

(iii) Describe the trend shown by the results.

(3)

As time increased, the volume of gas produced decreased. Volume of gas was at its maximum in the first 10 minutes and minimum in the last 10 minutes

ResultsPlus
Examiner Comments

This is a simple response but takes an overview of what has happened during the course of the investigation. Overall reduction, most produced at the beginning and the least at the end.

ResultsPlus
Examiner Tip

Write concise answers for these types of questions.

Question 3 (a)(iv)

A lot of the answers given were not clearly thought through or sequential and many failed to mention that the substrate would have been exhausted by the end of the investigation.

(iv) Explain the student's results obtained in the investigation.

(3)

Gas gradually decrease in volume because, ~~rate of reaction~~ Enzymes Active sites become occupied less Enzym Substrate complexes. ~~reaction~~ Substrate concentration decrease so rate of reaction decreases. less Substrate broken down less Product released, less gas Produced, substrate being used up

ResultsPlus
Examiner Comments

This candidate has made all of the points in the process, even though it appears a little garbled at times.

ResultsPlus
Examiner Tip

Use clear logical sequencing in these types of questions.

(iv) Explain the student's results obtained in the investigation.

(3)

The enzyme's activity rate is decreasing since the active site of the enzyme is changing over time in the experiment so less gas production

This candidate has only made reference to what is happening in terms of the results. The question asked for an explanation and one is not given.

Explain requires more than a description.

Question 3 (b)

The role of inhibitors is generally well understood except that a number of candidates thought that the active site was changed rather than blocked.

(b) Explain the effect on the results if the student had added a competitive inhibitor at the start of the investigation.

(2)

less enzyme substrate complex, as competitive inhibitor do competition with substrate and bind with active site of enzymes, so less active site found for substrate to bind with, by increase number of substrate, more challenge so more enzyme substrate complex formed

ResultsPlus
Examiner Comments

Whilst this candidate has stated what has happened is that the active site is blocked, there is no explanation as to the effect that this has had on the rate of reaction.

ResultsPlus
Examiner Tip

Explain questions require more than a description.

(b) Explain the effect on the results if the student had added a competitive inhibitor at the start of the investigation.

(2)

Competitive inhibtor will decrease the rate by competing with the substrate for the active site and bind complimentry it has the same Vmax to orginal ~~but~~ but lower Km as the rate decreased

ResultsPlus
Examiner Comments

This candidate just scores both marks with correct references to a decrease in the rate of reaction and, by implication, the fact that this is because the inhibitor has affected that active site. A better answer would have stated clearly that the active site was blocked or occupied by the inhibitor.

ResultsPlus
Examiner Tip

Keep answers clear.

Question 4 (a)

This was well answered by the majority of candidates, though a number of candidates put down sense organs rather than senses.

Question 4 (b)(i)

Many candidates identified correctly the inverse relationship between the two variables but did not state that it was an inverse relationship.

(b) The table shows how the focal length of the eye lens changes as the thickness of the lens changes.

Thickness of lens in mm	Focal length in mm
10	12.5
9	14.0
8	15.5
7	18.0
6	21.0
5	25.0

(i) Describe the relationship between the thickness of the lens and its focal length.

(2)

as the thickness of lens decreases the focal length increases.

ResultsPlus
Examiner Comments

Correct relationship identified.

ResultsPlus
Examiner Tip

Give full answers.

(b) The table shows how the focal length of the eye lens changes as the thickness of the lens changes.

Thickness of lens in mm	Focal length in mm
10	12.5
9	14.0
8	15.5
7	18.0
6	21.0
5	25.0

(i) Describe the relationship between the thickness of the lens and its focal length.

(2)

As thickness of lens decrease, focal length increase, and vice versa, as they are inversly proportional.

ResultsPlus
Examiner Comments

A full concise answer.

ResultsPlus
Examiner Tip

Ensure all answers mirror this approach.

Question 4 (b)(ii)

Many candidates stated increase rather than decrease.

Question 4 (b)(iii)

(iii) A person is looking at a distant object and then looks at a near object. accomodation lens more convex

Use the data in the table to explain the changes that occur in the eye so the person is able to form an image of the near object on the retina.

(4)

the ~~the~~ lens accomodate / accomodation takes place where the thickness of ~~length~~ lens increases and becomes more convex so the focal length decreases allowing more light to be refracted / to enter the eye allowing eye so ~~be~~ be focused on ~~near~~ near objects

ResultsPlus
Examiner Comments

This candidate only described part of the process with references to change in lens thickness and focal length, though it was encouraging to see the correct use of the given data.

ResultsPlus
Examiner Tip

Give full answers.

(iii) A person is looking at a distant object and then looks at a near object.

Use the data in the table to explain the changes that occur in the eye so the person is able to form an image of the near object on the retina.

(4)

The cialary muscle will relax and the suspensory ligments will streatch which made the lens to become thinner like 5 which will make the focal length to increase 25.0 so we will see the near object and the inverted image formed on retina will be transported in ~~ecte~~ electrical impulse through optic nerve to the vistual centre in the brain

ResultsPlus
Examiner Comments

Unfortunately this candidate did not specify whether the reference was to a near or distant object which might have salvaged some marks; there is also some irrelevant material.

ResultsPlus
Examiner Tip

Make sure answers stick to what is relevant.

(iii) A person is looking at a distant object and then looks at a near object.

Use the data in the table to explain the changes that occur in the eye so the person is able to form an image of the near object on the retina.

(4)

When looking changing from looking at a distant object to looking at a near object, the eye accommodates. Now, the ciliary muscles contract & the suspensory ligaments slacken increasing the thickness of the lens, becoming more convex so that the lens could refract the diverging, non-parallel, light rays coming from the near object. This decreases the focal length & the image focuses on the retina so it's clear.

ResultsPlus
Examiner Comments

Excellent answer that sets the context and then describes clearly and simply what is happening with no irrelevant material.

ResultsPlus
Examiner Tip

Keep answers relevant.

Question 4 (c)(i)

Most candidates answered this question correctly.

Question 4 (c)(ii)

A simple calculation which most candidates answered correctly.

Question 4 (c)(iii)

(iii) Suggest why it is better to have three types of cone rather than just one type of cone.

(2)

two identify different colours such as red, green, and blue.

to easily refract & light to cones.

ResultsPlus
Examiner Comments

This candidate made no reference to wavelength absorption.

ResultsPlus
Examiner Tip

Give full answers, four lines and two marks means two valid comments are required.

(iii) Suggest why it is better to have three types of cone rather than just one type of cone.

(2)

As to be able to absorb all light ~~absorbed~~ ~~any type~~ wavelength with maximum light absorption to give you most ~~clear~~ clear colored vision.

ResultsPlus
Examiner Comments

A good full answer mentioning both relevant points.

ResultsPlus
Examiner Tip

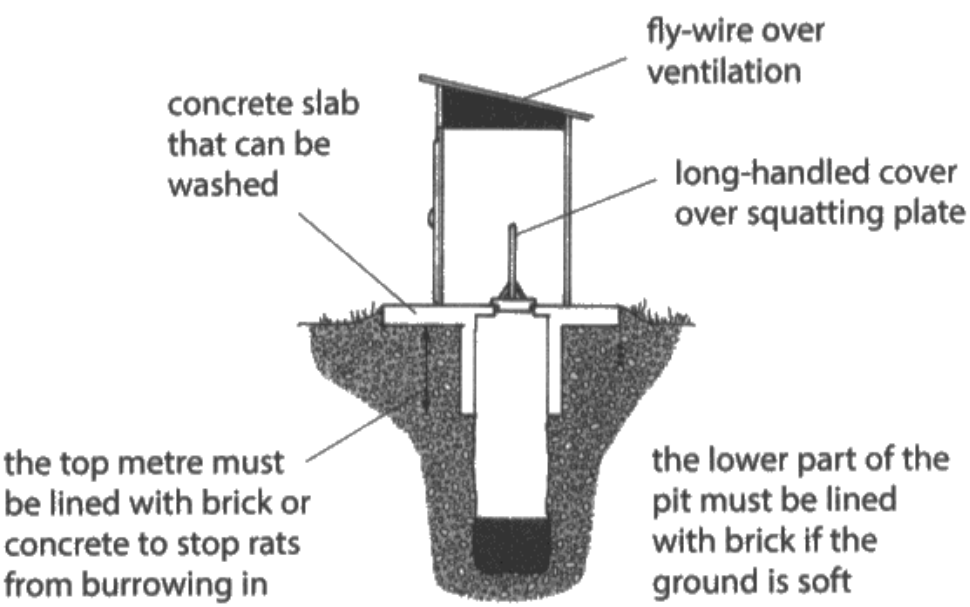
Two marks, two points.

Question 5 (a)(i)

Whilst many candidates appreciated that the siting would prevent the contamination of the well water, very few understood that water would run downhill away from the well and not into it when it rained.

5 Pit latrines can be used to get rid of urine and faeces. They can be used where the soil is permeable to water and are always placed downhill from wells.

The diagram shows a pit latrine.



(a) (i) Explain why a pit latrine should be placed downhill from a well.

(2)

- To prevent Polution of environment
- Faster decomposition

ResultsPlus
Examiner Comments

This candidate was not awarded any marks because even the attempt to describe contamination was so vague as to be meaningless.

ResultsPlus
Examiner Tip

Try to avoid vague generalisations in answering this type of question.

(a) (i) Explain why a pit latrine should be placed downhill from a well.

(2)

to prevent urine and faeces in lower part of pit to leake into the clean water in well anel contaminate it. The water from well will flow down anel reach the urine & anel

ResultsPlus
Examiner Comments

This candidate was awarded two marks as there is a clear reference to the prevention of contamination. The reference to the run off of water downhill is a little more vague but was the best of what we saw in response to this question.

ResultsPlus
Examiner Tip

Be as specific as possible with this type of question.

Question 5 (a)(ii)

A significant number of candidates referred to osmosis which is not appropriate in answering this question. The graining of the liquid parts of faeces and urine was what was needed.

Question 5 (a)(iii)

This was really a question that required an input of knowledge from more than one part of the specification. Firstly, candidates needed to reflect upon the role of vectors in the possible transmission of pathogenic organisms and disease. Secondly, they needed to discuss how the long handle reduced the risk of transmission of pathogenic organisms.

(iii) Explain why, when a pit latrine is not in use, the latrine should have a cover and why the cover should have a long handle.

(5)

- don't use the latrine when it is the reproductive season of flies as they lay their eggs ~~make~~ on the feaces so they won't increase in number also the ~~egg~~ flies that got out from the eggs that hatched will carry the feaces and may contaminate food, spreading diseases
- the latrine should be covered to make flies unable to reach the feaces so they don't stand on it or lay eggs and transmite it to food which will contaminate it and cause spreading of disease,
- the cover has a long handle as the person can easily remove it to excrete and then cover it back after he finishes also so ~~it~~ it isn't contaminated by the feaces by being far from the pit so when another person holds it no disease will be transmitted to his hands

ResultsPlus Examiner Comments

This candidate gave a partial answer by referencing the role of flies as vectors in the transmission of disease. There was also some reference to contamination being reduced by having a long handle to the cover though the answer lacked clarity.

ResultsPlus Examiner Tip

Set out answers in a sequential manner and don't jump about all over the place.

(iii) Explain why, when a pit latrine is not in use, the latrine should have a cover and why the cover should have a long handle.

(5)

cover should have long ~~handle~~ handle so handle is far away possible from bottom where urine and faeces get dumped under. ~~To top~~ to prevent someone from falling ~~Sh~~ latrines should be covered to avoid ~~fly~~ any possible way of transmission of disease to people in town or cities.

ResultsPlus
Examiner Comments

This candidate touched on a couple of points but was so vague and incomplete that no marks could be awarded.

ResultsPlus
Examiner Tip

If there are five marks for a question then five valid points need to be made, not just vague generalisations.

(iii) Explain why, when a pit latrine is not in use, the latrine should have a cover and why the cover should have a long handle.

(5)

The long handle of the pit latrine will make sure the person will not get incontact with any of the sewage covered by the lid.
This cover will stop the bad smell.
The cover will make sure that no flies get in so that the flies will not be able to touch any sewage and contaminate to humans through food or skin contamination, this will prevent the flies from transmiting any disease

ResultsPlus
Examiner Comments

This candidate made a number of correct statements but failed to link them together in a really coherent answer. Smell, flies and contact with faeces are all relevant points so it is a pity that the answer wasn't more comprehensive.

ResultsPlus
Examiner Tip

Try to write full accounts to questions where there are a number of marks allocated.

Question 5 (b)

(b) The concrete slab shown in the diagram is washed regularly with an antibacterial solution.

A scientist wants to investigate two antibacterial solutions to see which solution is more effective.

Design an investigation the scientist could use to find out which of the two antibacterial solutions is more effective.

Include experimental details in your answer and write in full sentences.

(7)

There are multiple different ways the ~~effectiveness~~ effectiveness of two antibacterial solutions can be tested. The first I can think of is taking two identical surfaces and dirtying them the same ~~amou~~ amount, then cleaning them just as ~~thoug~~ ~~th~~ much ~~as~~ as each other, one with the first solution and one with the second solution. Then, after the cleaning is done, shining a blacklight on the two surfaces and seeing which one has more bacteria on it. Needless to say, this test is quite ~~unr~~ unreliable. Another experiment I can think of is getting two sets of bacteria, ~~each with~~ on two slides, each with the same number and type of bacteria as the other, then exposing each set of bacteria to the same quantity of a different antibacterial solution, and using a microscope to see the bacteria's reaction, noting down how much bacteria from each set is killed and ~~in how much~~ the time in which it ~~happe~~ happened. These results should tell you which antibacterial solution is most effective.

ResultsPlus
Examiner Comments

This candidate was able to give the idea that two concrete slabs should be tested with the antibacterial solution. However, the method of assessing the results is wholly impracticable indicating that the candidate had perhaps not carried out any practical work in microbiology.

ResultsPlus
Examiner Tip

Learn the practical techniques given in the specification.

(b) The concrete slab shown in the diagram is washed regularly with an antibacterial solution.

A scientist wants to investigate two antibacterial solutions to see which solution is more effective.

Design an investigation the scientist could use to find out which of the two antibacterial solutions is more effective.

Include experimental details in your answer and write in full sentences.

(7)

Take two of the same type of concrete slab and place them in the same environment (same temperature, weather, light etc.). *

Wash half of slab one with the first antibacterial solution and wash half of slab two with the second antibacterial solution.

Leave both slabs for an hour. Come back and inspect both the washed and unwashed halves of each slab.
Record which antibacterial solution was more effective.
Repeat the experiment three times.

* Make sure there is no/minimal difference in the amount of bacteria on each slab.

Whilst this candidate made a reasonable attempt at starting the investigation with the slabs and the two antibacterial solutions the account petered out when it came to assessing the results. There was a total lack of detail as to how the results would be obtained and treated.

Learn the practical techniques mentioned in the specification.

(b) The concrete slab shown in the diagram is washed regularly with an antibacterial solution.

A scientist wants to investigate two antibacterial solutions to see which solution is more effective.

Design an investigation the scientist could use to find out which of the two antibacterial solutions is more effective.

Include experimental details in your answer and write in full sentences.

(7)

Independant: USe diffrent antibacterial Solutions and Control by carrying out the expirment using water to make sure that antibacterial Solution Is the reson ~~Bac~~

Dependant: Measure the diffusion distance of the clear part in the agar disk (antibiotic Sensitivity test is carried out and antiseptic test)

Standartise. Same tempreture at 30°c using thermostatically controlled water bath and pH using buffer at 7 and same volume of antibacterial Solution and same concentration of antibacterial solution and same area of concrete slab is used and same time used in testing

setup get a sample from smearing it on concrete after cleaning it with both antibacterial solution and use circular loop to smear it on the agar ~~tube~~ and dont open lead to prevent entrance of another bacteria tie hair back and Make sure everything around you is hygeneated wear gloves and goggles to prevent contact with bacteria

Repeat 3 times, exclude anomelous and calculate mean and compare amount of bacteria found in both the less bacteria present the better the antibacterial solution

(Total for Question 5 = 15 marks)

(rest in blank Page 11)

Whilst this account could have been improved in terms of its construction and flow of ideas and the sequencing of the procedures, it nevertheless covered many of the points that were set out in the mark scheme and demonstrated an understanding of the required practical techniques to undertake this investigation.

Set out a sequence of events in rough before committing to the final answer.

Question 6 (a)(i)

Virtually all candidates were able to identify phagocytosis as the correct term though some could not spell the word correctly.

Question 6 (a)(ii)

(ii) Describe what is happening at stages 1, 2 and 3 shown in the diagram.

(3)

stage 1

lysosome move to vesicle ~~move to~~ containing bacterium and fuse with it releasing hydrolytic enzyms

stage 2

hydrolytic enzyms digest bacteria and kill it without digesting antigens

stage 3

nonself antigens of bacterium move to cell surface membrane and fuse with it, while waste products of digested bacteria are removed by exocytosis [illegible]

forming antigen presenting cell

ResultsPlus
Examiner Comments

This candidate clearly distinguished all three separate processes and used the correct terminology thereby leaving the examiner in no doubt as to what the candidate meant.

ResultsPlus
Examiner Tip

Try to learn and use correct biological terminology.

(ii) Describe what is happening at stages 1, 2 and 3 shown in the diagram.

(3)

stage 1

bacteria is releasing an enzyme to digest the bacteria. Lysosome goes to the vesicle with bacteria.

stage 2

The bacteria is being digested. antibodies are being produces.

stage 3

exocytosis of the unwanted remains of bacteria. and putting the antigens of bacteria on the cell surface membrane

ResultsPlus
Examiner Comments

This candidate has described the same process occurring at both stage one and stage two and should have realised that this was not going to be correct in both cases.

ResultsPlus
Examiner Tip

Read the whole answer written down when completed.

Question 6 (a)(iii)

This question was very poorly answered. Whilst some reference to labelling the cell should have been clear from the diagrams in the paper few candidates made any reference to this. Even if candidates were not able to use the correct terminology it should have been apparent that what was happening would lead to a more rapid response on reinfection.

(iii) Suggest the function of the structures labelled X.

(2)

Memory cells produced by lymphocytes help in secondary immune response the next time same antigen is met, the antibodies will be sent in greater quantity at a faster rate.

ResultsPlus
Examiner Comments

Although this candidate has not expressed themselves very well, both ideas are present and so could be awarded the marks.

ResultsPlus
Examiner Tip

Use the source material provided in the question to help frame answers.

(iii) Suggest the function of the structures labelled X.

toxins. (2)

The digestive enzymes (lysosomes) are kept inside in the phagocyte and the destroyed bacterium is released without the enzymes

ResultsPlus Examiner Comments

This candidate has made no reference to structure X and has just answered what appears to be another question.

ResultsPlus Examiner Tip

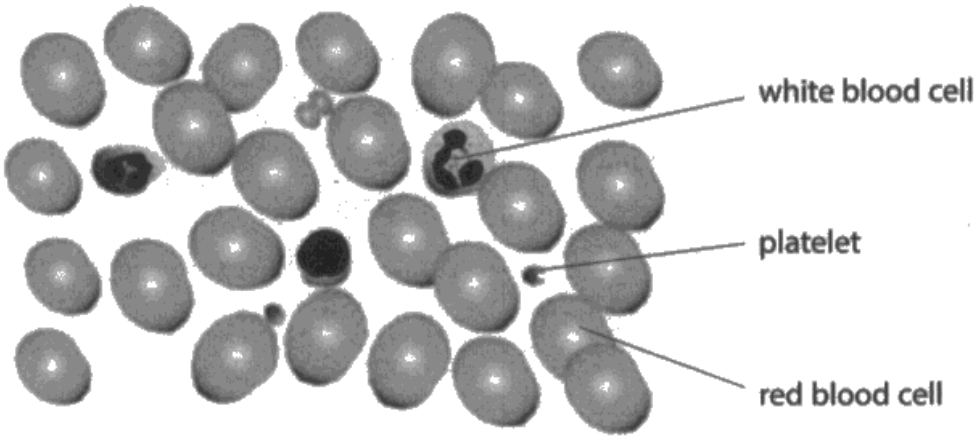
Answer the question set.

Question 6 (b)(i)

As with most of the other questions that dealt with the practical aspects of the specification this one was poorly answered by the majority of the candidates. It was apparent that very few candidates had actually prepared a blood slide or had any idea how one should be prepared in a laboratory.

(b) A student observes a prepared slide of blood under a light microscope.

The student draws this diagram of what could be seen.



(i) Describe how the slide of human blood could be prepared.

(3)

First, store human blood cells ~~in sealed~~ petridish. Place a sample of human blood on a slide. Add a stain to see sample clearly. Close slide tightly. Wear gloves during this process to avoid contamination to avoid cross-contamination and spread of infection. Place ~~on~~ under microscope. Adjust objective lens. Focus light onto sample until it can be seen clearly. Adjust knobs on microscope.

ResultsPlus
Examiner Comments

This candidate only scored a mark for a correct reference to the application of a stain. There is no meaningful description as to how a blood smear should be produced.

ResultsPlus
Examiner Tip

Understand practical techniques.

(i) Describe how the slide of human blood could be prepared.

(3)

gather all equipment to perform the experiment

With the slide ready on a sterile plate, the student should first wash hands, then get an alcohol wipe and clean the area ie finger. Once dried naturally using a sterile pin create a break in the skin and collect a drop of blood. Drop the blood onto the slide and smear with a plate covering

ResultsPlus
Examiner Comments

This candidate had a clearer idea than most as to how to collect blood for a smear. The candidate emphasised the need to use sterile equipment and to reduce the risk of contamination. The answer could have been improved with a reference to how the blood was smeared and the need to make it a thin smear.

ResultsPlus
Examiner Tip

Know practical techniques.

(i) Describe how the slide of human blood could be prepared.

(3)

- get a sample of human blood and stain it
- transfer it on a microscopic slide and cover it with coverslip
- then put it on stage of light microscope
- view with 10x (low power) ~~power~~ first then view with higher power (40x) to view more specific features

ResultsPlus
Examiner Comments

This candidate recognised the need to stain the blood smear but failed to give any insight into how else it should be prepared.

Question 6 (b)(ii)

This was poorly answered with few candidates scoring more than one mark. The impression given was that few candidates had seen a blood smear under the microscope and therefore did not know what to expect.

(ii) Discuss the accuracy of the student's diagram.

(4)

Red blood cells have no nucleus.
Platelets smaller than rest of cells.
White blood cells contain nucleus, not with different shapes.

Too few platelets drawn.
White blood cells should be larger than red blood cells.

ResultsPlus
Examiner Comments

This candidate recognised that white blood cells should be larger in size than red blood cells. However, they discussed the absence of plasma which would not appear on a blood slide anyway and platelets are too small to be seen by a light microscope.

ResultsPlus
Examiner Tip

Study photomicrographs of blood smears and identify each component.

Question 6 (b)(iii)

Whilst many candidates recognised that this would reduce the risk of infection, very few mentioned a disease that could be spread in this way.

Question 7 (a)(i)

The quality of graph plotting continues to decline amongst many candidates. Many candidates do not even follow the basic requirements to draw graphs using a sharp pencil. Straight lines should be drawn with the aid of a ruler. The scale that is used should always cover a minimum of half of the graph paper and care should be taken to ensure that the X and Y axes are the correct way round.

7 A method that shows whether a person's kidneys are working correctly is to measure the volume of filtrate produced by the kidneys in one minute. This is known as the glomerular filtration rate (GFR).

A person with healthy kidneys has a GFR of over 100 cm^3 per minute.

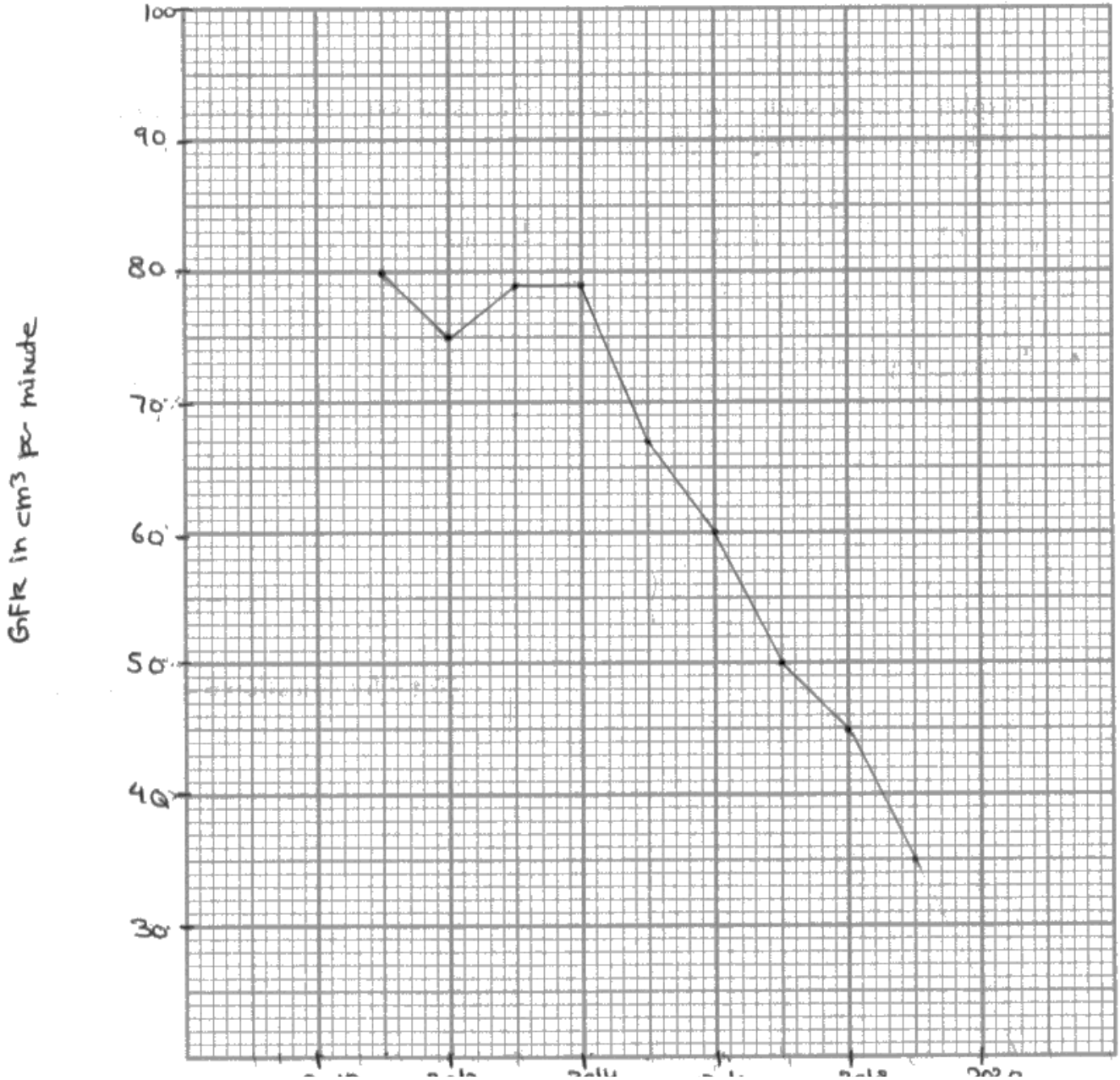
The GFR of a person whose kidneys were not working correctly was measured once a year for nine years.

The table shows the results.

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019
GFR in cm^3 per minute	80	75	79	79	67	60	50	45	35

(a) (i) Plot a line graph of the data on the grid.

(4)

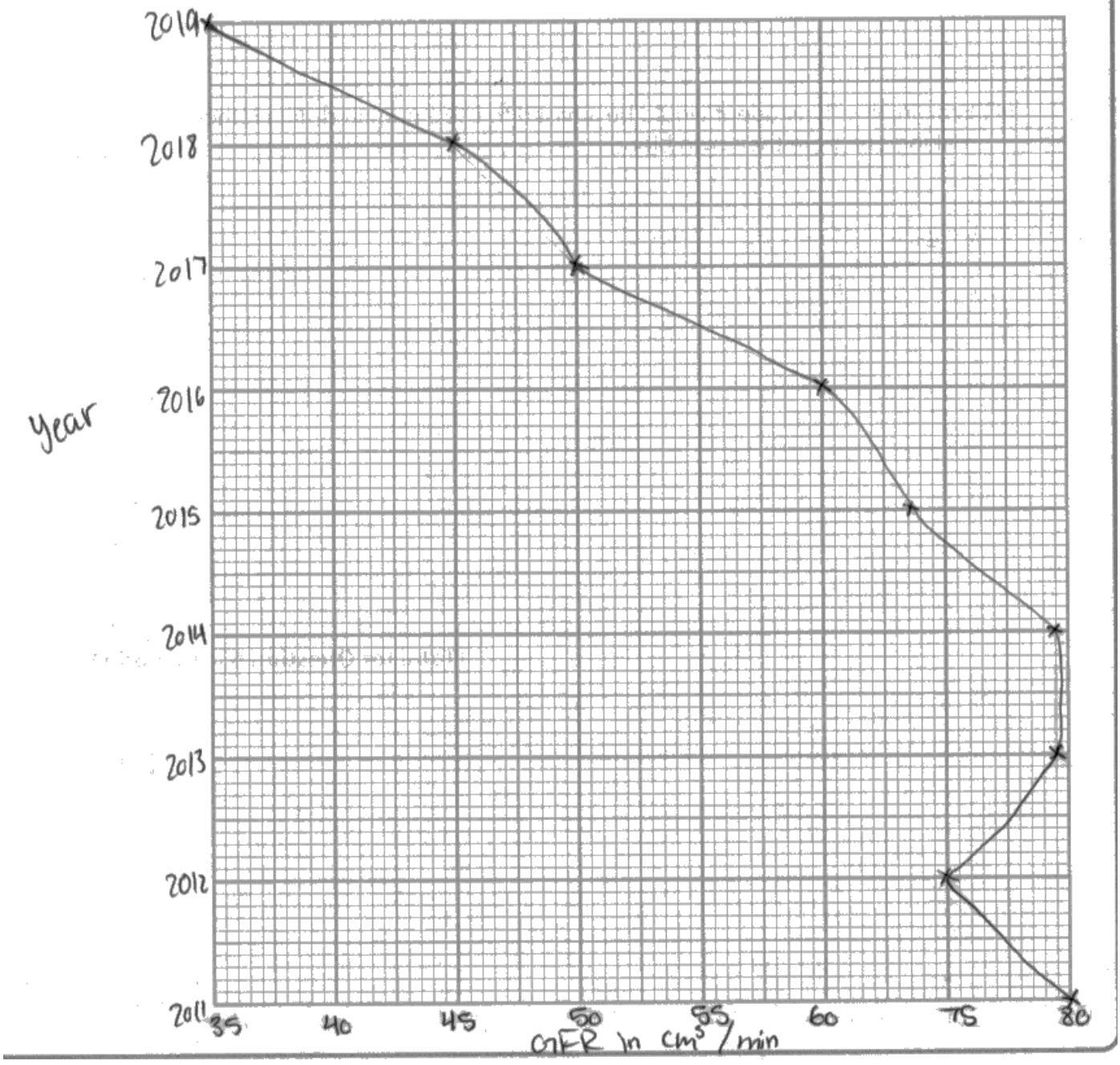


This is a good example of how a graph should be drawn noting the points made in the general comment.

Invest in a ruler and a pencil sharpener.

(a) (i) Plot a line graph of the data on the grid.

(4)



ResultsPlus
Examiner Comments

This candidate confused the X and Y axes and tried to draw a line freehand.

ResultsPlus
Examiner Tip

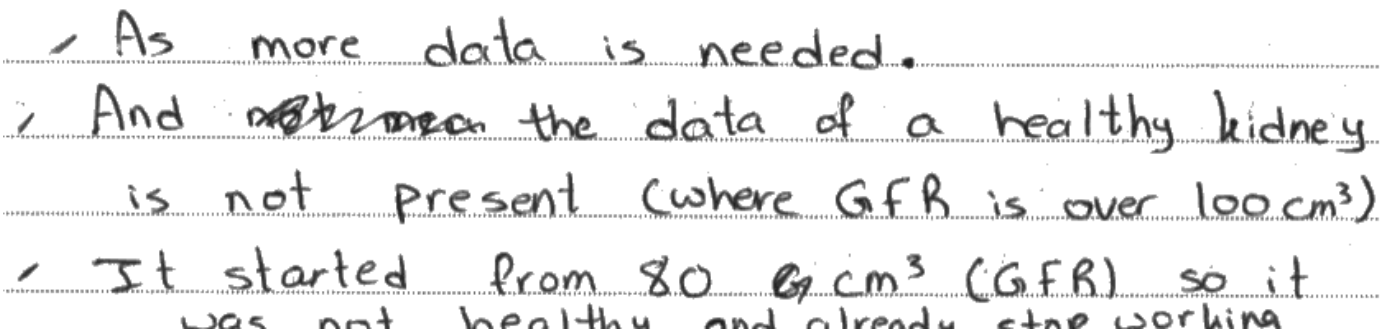
Invest in a ruler and pencil sharpener.

Question 7 (a)(ii)

Candidates failed to state the points that kidneys are only not considered to be working correctly when the rate falls below 100 and that the data doesn't show when that occurred.

(ii) Explain why it is not possible to determine from the data when the person's kidneys stopped working correctly.

(2)



ResultsPlus
Examiner Comments

This candidate has understood the issues and has expressed the answer clearly.

ResultsPlus
Examiner Tip

Read the data.

(ii) Explain why it is not possible to determine from the data when the person's kidneys stopped working correctly.

(2)

because for 2 years he had the same GFR results which is 79

ResultsPlus
Examiner Comments

This candidate has not understood what is required even though the data is quite clear.

ResultsPlus
Examiner Tip

Read the data.

Question 7 (a)(iii)

(iii) A person needs dialysis if the GFR falls to 15 cm^3 per minute.

Use the data to estimate when the person will probably need to start dialysis.

(2)

Estimating from the data given, the GFR per minute in 2020 would probably be 25 cm^3 and the next year it would likely be around 15 cm^3. The person should start dialysis in 2021.

ResultsPlus
Examiner Comments

This candidate stated the correct year but the reasoning behind the answer was confused.

(iii) A person needs dialysis if the GFR falls to 15 cm^3 per minute.

Use the data to estimate when the person will probably need to start dialysis.

(2)

The data shows that after 2014 the GFR falls at an average estimated rate of 10 cm^3 per year. Following this trend it is likely this person will reach a GFR of 15 cm^3 and require dialysis by 2021.

ResultsPlus
Examiner Comments

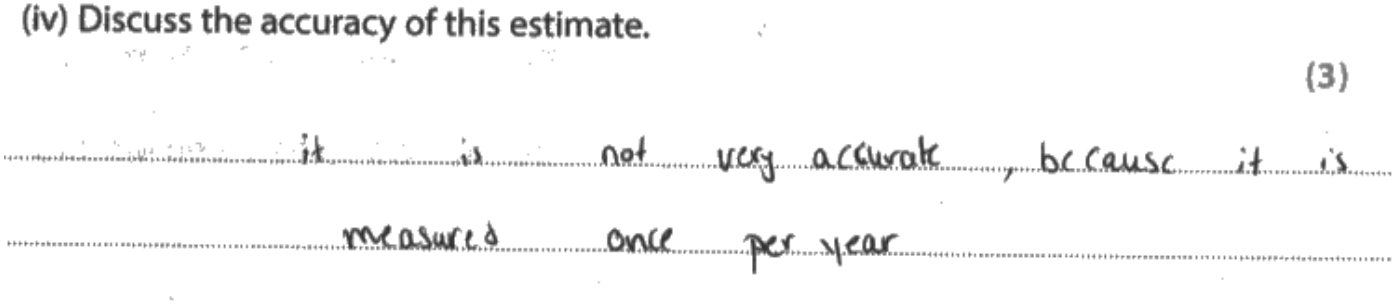
This is an excellent answer which is clear and to the point.

ResultsPlus
Examiner Tip

Use this answer as a model.

Question 7 (a)(iv)

Whilst many candidate stated that the date was not really accurate, they struggled to find reasons why and could not express themselves in a clear way.



ResultsPlus
Examiner Comments

The idea that it is not very accurate is not substantiated. The fact that the data is only collated once a year is not relevant.

(iv) Discuss the accuracy of this estimate.

it is not accurate, as the decrease is not linear, the decrease rate changes in every year, the GFR may even increase, as what happened in 2012, or may stay constant as 2013 to 2014, so it is just an estimate, can't predict the future.

ResultsPlus
Examiner Comments

This candidate has a better idea of the reasons behind the results not being particularly accurate and has used the data supplied to justify the judgement.

ResultsPlus
Examiner Tip

Use the data when supplied.

Question 7 (b)

Many candidates were unable to link the breakdown of excess proteins into amino acids and their subsequent deamination with the poorly performing kidneys. Many candidates failed to state the obvious that it is the kidneys that excrete the urea and if they are not performing adequately it means that extra urea will not be excreted and there is a toxic build up.

(b) During the early stages when a person's kidneys are not working correctly, they are advised to control the amount of protein in their diet.

Explain why the protein in their diet should be controlled.

(3)

As proteins is broken down at the stomach ~~out~~ by pepsin and the Duodenum by trypsin, ~~to~~ into amino acids, Then excess amino acids goes to the liver to be deaminated by deamination into urea, Then urea will go to the ~~to~~ kidney to be excreted, so more proteins puts the kidney in an overload, so it will not function properly as it already not working correctly, so urea is not able to be excreted from the blood, so ~~stay~~ stay at the blood, so it ~~increases the activity~~ increases toxicity at the blood, so most of cells may die, and ~~person~~ patient may develop severe side effects or other diseases, or may develop death.

ResultsPlus
Examiner Comments

This is a good answer that tells the whole story including an increase in toxicity if a high protein diet is followed.

ResultsPlus
Examiner Tip

Always give full relevant details in answering this type of question.

(b) During the early stages when a person's kidneys are not working correctly, they are advised to control the amount of protein in their diet.

Explain why the protein in their diet should be controlled.

(3)

When kidney is infected, it can't reabsorb the amino acids and some large proteins get filtered and not reabsorbed by proximal convoluted tubule by endocytosis so proteins are found in urine by ~~kidney~~ excreted along with urea. Decreasing protein intake, decreases filtration of protein and its presence in urine so less work done by kidney and it is relieved.

ResultsPlus
Examiner Comments

This candidate's answer is typical of many whereby the discussion is all about large protein molecules not being filtered by the Bowman's capsule. This misses the point that the protein in the diet will have been digested and absorbed as amino acids.

ResultsPlus
Examiner Tip

Think through processes in answering this type of question.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure that the workings for all calculations are shown.
- Show workings in a logical sequence.
- Always write in clear, full sentences.
- Focus answers on the question asked and avoid writing down everything known about a topic.
- Ensure that even if they have not had the facility to carry out practical work in a laboratory situation that they have gone through the stages of a practical so that they are able to describe an experiment.

Grade boundaries

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