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BIOLOGY

Paper 0610/12
Multiple Choice (Core)

Question Number	*Key*	*Question Number*	*Key*
1	**C**	21	**B**
2	**A**	22	**B**
3	**C**	23	**B**
4	**C**	24	**C**
5	**D**	25	**C**
6	**C**	26	**D**
7	**B**	27	**D**
8	**A**	28	**C**
9	**C**	29	**B**
10	**D**	30	**C**
11	**D**	31	**D**
12	**A**	32	**C**
13	**A**	33	**D**
14	**B**	34	**D**
15	**C**	35	**C**
16	**B**	36	**B**
17	**C**	37	**D**
18	**C**	38	**C**
19	**C**	39	**A**
20	**D**	40	**C**

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level. There was uncertainty about the convention for writing the scientific name of a species and the functions of different parts of cells. Applying knowledge of levels of organisation proved to be challenging for some. Some candidates were uncertain about the products of photosynthesis and the details of the food test for vitamin C. Some were uncertain about the approximate percentages of oxygen and carbon dioxide in inspired air. One misconception was that the chromosomes are found in the cytoplasm. There was a good understanding of how to calculate magnification and the meaning of osmosis. Most candidates also knew that the pancreas produces insulin.

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Comments on specific questions

Question 1

Many candidates gave the correct response. Some found it more challenging with incorrect distractors being selected with equal frequency.

Question 2

This question was well-answered although a few did not appreciate that the first letter of the species part of the name is written in lower case.

Questions 4

Many candidates appreciated that the cell on the right is a palisade cell and can therefore make starch. The commonest incorrect response was that only one cell could control the movement of substances into the cell.

Question 5

While many candidates opted for the correct response, some incorrectly believed that the chromosomes are found in the cytoplasm.

Question 6

This proved to be a challenging question with few being able to apply their knowledge to identify the correct level of organisation.

Question 7, 9, 21, 24 and 35

These questions were well-answered by nearly all candidates.

Question 11

Most candidates identified the correct gas. The commonest incorrect response was carbon dioxide.

Question 14

Identifying the correct tissues and relating the tissues to their functions proved to be challenging for many candidates.

Question 15

Some candidates were able to identify the correct part of the leaf but many found this challenging. Similar numbers opted for each of the incorrect distractors.

Question 18

While many understood that hairs in the nose and mucus help to prevent pathogens reaching the alveoli when breathing in, some also incorrectly believed that antibodies or the skin are also involved.

Question 20

This proved to be a challenging question with most candidates not appreciating that all forms of respiration involve the action of enzymes.

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Question 22

Some candidates knew that it is the iris that controls the amount of light entering the eye. Many incorrectly opted for the cornea, lens or retina.

Question 25

Although some candidates understood that antibiotics can be used to treat bacterial infections, others believed that antibiotics can be used to treat infections caused by all pathogens or caused by bacteria and viruses.

Question 26

Some realised that the presence of a flower or a fruit indicates that sexual reproduction is involved.

Question 27

The majority of candidates correctly recalled the conditions required for germination. The commonest misconception is that light is always required for germination.

Question 30

The definition of a gene was well-known. The commonest incorrect response was chromosome.

Question 34

Most candidates gave the correct response. The commonest incorrect response was glucose.

Question 37

Many knew that the transfer of genes is involved. Selective breeding was the commonest incorrect response.

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BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

Question Number	Key	Question Number	Key
1	**C**	21	**C**
2	**A**	22	**D**
3	**D**	23	**B**
4	**C**	24	**A**
5	**C**	25	**D**
6	**B**	26	**B**
7	**A**	27	**D**
8	**C**	28	**A**
9	**A**	29	**C**
10	**D**	30	**C**
11	**B**	31	**B**
12	**D**	32	**A**
13	**C**	33	**D**
14	**A**	34	**A**
15	**C**	35	**D**
16	**B**	36	**B**
17	**C**	37	**C**
18	**C**	38	**B**
19	**C**	39	**D**
20	**C**	40	**B**

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level.

Comments on specific questions

Question 1, 2, 3, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 17, 20, 21, 24, 26, 29, 31, 34, 35, 37, 38 and 39.

The majority of candidates gave the correct responses to these questions.

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Question 15

While many candidates understood that the change in the concentration of maltose at X was caused by the action of maltase, some incorrectly believed it was because maltose is absorbed.

Question 16

Most candidates gave the correct response but there was some uncertainty about the positions of the xylem and phloem in a stem.

Question 22

This proved to be a challenging question with few appreciating that all forms of respiration involve the action of enzymes.

Question 27

While many candidates identified the correct option, some were uncertain about the effect of auxin on a shoot tip.

Question 28

Most candidates knew that MRSA is a bacterium. The commonest incorrect response was virus.

Question 30

While many candidates correctly identified oestrogen from the graph, some were less certain. Incorrect distractors were chosen with equal frequency.

Question 32

Many candidates were able to correctly determine which parents could produce offspring with blood group O. Some incorrectly believed that a homozygous father with blood group A and homozygous mother with blood group O could produce offspring with blood group O.

Question 40

Although most candidates knew the sequence of events involved in eutrophication, some found this question challenging.

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BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

Candidates must read the question carefully and then target their answer to this.

General comments

There were some excellent scripts produced by the candidates who were well prepared for the examination. Most candidates attempted all the questions and there was no evidence that any candidate had insufficient time in which to complete their work. Most of the scripts were clearly legible.

Comments on specific questions

Question 1

(a) Many candidates could state the names of three other groups of substances in the diet. Some candidates stated the name of a specific mineral ion instead of naming the group and could not receive credit for this.

(b) All the correct linkages between conditions and their causes were made by many candidates. Many candidates made two correct linkages only, these typically being the ones involving starvation and obesity. The cause of scurvy was not well known.

Question 2

(a) This question discriminated well. Most candidates were able to place 'oxygen' and 'energy' correctly in the first two spaces, but many candidates did not fully understand the processes involved.

(b) The role of carbon dioxide in making bread was widely known. The production of alcoholic drinks was a less frequently seen answer and very few candidates referred to the production of biofuels. Other correct uses, such as carbon dioxide in carbonated drinks, were accepted, but rarely cited.

(c) Some candidates quoted the four results from the bar chart and did not attempt to convert the results into a trend. Good answers stated that the shorter the distance of the race, the greater the energy provided by anaerobic respiration (or vice versa). The majority of candidates received partial credit as the instruction to 'use data to support your answer' was not followed. Some candidates attempted to explain the results, but this had not been asked for in the question.

Question 3

(a) Almost all candidates gained credit for drawing a pupil smaller in diameter than the first example. A very few candidates drew pupils that were either vertical or horizontal slits.

(b) (i) Some candidates were very confident and knew the pathway for a reflex arc, other candidates found this question challenging.

(ii) Many candidates gave synapse, spelled correctly. Some candidates gave the word 'neuro-transmitter' and whilst this chemical would be present in the gap, it is not the name of the gap itself.

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(c) A very few candidates only gained the first mark for stating the action of insulin. Insulin acts to lower the blood glucose concentration and those candidates who stated that insulin 'regulates' or 'controls' did not gain credit as this answer is not precise enough. References to blood glucose level in the body and the role of pancreatic secretions in digestion were not awarded credit.

Adrenaline was more widely known and nearly every candidate knew that testosterone was made in the testes. Many could also state a function for testosterone.

Question 4

(a) This was fairly well answered, with many candidates naming three different examples of modern technology. The majority of answers cited various forms of machinery and categories of chemicals that are applied to crops. Genetic engineering and selective breeding were infrequent answers. Some candidates could give one or two examples only of modern technological used in food production.

(b) Most candidates answered the question by describing the disadvantages of a monoculture system, whereas the question asked for its effects on the wider eco-system. There were a few excellent and comprehensive answers, but these were rare.

Question 5

(a) The general pattern was for candidates to state an adaptive feature of a sperm (usually that it had a flagellum/tail or that it had a streamlined shape) but be unable to state an adaptive feature of an egg cell. Some candidates merely described the functions of the gametes in general reproductive terms.

(b) Many candidates stated two actions that a woman should avoid during pregnancy. There was a widespread misconception amongst candidates that women should avoid any type of physical activity during pregnancy, whereas the latest research indicates that physical activity is beneficial.

(c) (i) Widespread confusion exists between the functions of the amnion and of the placenta. Many candidates who gained credit gave combined answers with the salient facts about placental functions contained somewhere therein.

(ii) Many candidates wrote about changes that would occur during pregnancy rather than during the birth process.

Question 6

(a) (i) A significant number of candidates did not attempt to draw the path of the water molecule. Others seemed unfamiliar with the section through a root and ended their lines in the cortex. A considerable number of the remaining candidates ended their line on the phloem.

(ii) Many candidates gave the correct answer of osmosis. Other processes frequently named were diffusion, absorption, assimilation and active transport.

(iii) Most candidates named xylem.

(b) (i) The vast majority of candidates selected the correct information from the graph.

(ii) Candidates were asked to describe and explain the results shown in the graph. Very few candidates attempted the explanation. There were many sound descriptions given but also many answers where figures were quoted in isolation without any conclusions being drawn.

(c) To gain both marks, it was necessary for candidates to give a precise function for the mineral ion that had been selected, i.e. chlorophyll production or amino acid formation for magnesium and nitrate ions respectively. Some candidates citing other mineral ions were unable to give a precise function. Some statements, such as 'for good growth' are too vague to gain any credit.

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Question 7

(a) (i) This was well answered by some candidates. Other candidates named two specific blood vessels and not the types of vessels.

(ii) Very many candidates wrote about the function of arteries and not about their structure.

(b) (i) Prevalent misconceptions were that the blockage was caused by a lump of fat, that the blockage could occur in any artery or that it could be in one of the heart chambers. Many candidates said that the heart muscle had died because there was a blockage without being more precise.

(ii) On the whole this was well answered with many candidates stating three correct risk factors. Some candidates incorrectly referred to dietary factors.

Question 8

This was answered accurately by most candidates. The main misconceptions were that diffusion occurs in plants only and that sexual reproduction occurs in animals only.

Question 9

(a) The definition of a pathogen was known by many candidates. Some candidates tended to confuse that the pathogen was the disease caused.

(b) Many candidates could give an example of each type of body defence. Some candidates answered the question by giving examples of contraceptive devices.

(c) (i) The main purpose of washing is to remove something from the surface of the skin. This removal process was frequently not stated. As before, there was confusion between a pathogen and the disease caused.

(ii) Some candidates referred to the greater efficiency of biological powders which was not credit-worthy. More able candidates pinpointed the fact that these powders contain enzymes. Frequently no further information about the names of the enzymes or the products of digestion were given.

(d) This was not well answered. Most candidates did not refer to transmission of pathogens. Many referred to the transmission of diseases. A large number wrote about the processes involved in hygienic food preparation.

Question 10

(a) Many candidates did not know this definition.

(b) Candidates could usually name a relevant lung disease.

(c) Many candidates identified the liver correctly.

(d) Most candidates could name the class of drugs as antibiotics, or some gave the name of a specific antibiotic. Other candidates referred to medicinal drugs or to antibodies.

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BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

A very high standard of scientific knowledge and understanding was displayed by many of the candidates. It was pleasing to see so many articulate and accurate responses.

There were some questions where candidates had to identify parts from diagrams such as questions **1(b)** and **6(a)(i)**. It is important to study diagrams carefully and in particular the part that each label line is pointing to.
Candidates should be encouraged to read the stimulus material carefully. Questions such as **1(c)(ii)** and **5(a)(i)** required a description of the data. The best responses provided additional information rather than just quoting figures. Not all were clear as to the difference between the command words describe and explain.

General comments

Candidates generally showed good use of scientific terminology and expressed their ideas in continuous prose.

A good understanding of the key command words will ensure that candidates answer the question asked.

Comments on specific questions

Question 1

(a) Most candidates could describe some of the main points from the definition of the term *excretion*. Descriptions of examples of excretion or excretory products were not required.

(b) Many candidates identified the correct parts of the kidney. A common error was to give cortex for medulla and vice versa. The renal vein was sometimes incorrectly identified as the ureter or pelvis.

(c) (i) The majority of candidates identified the correct values for the solute concentration of the blood in the renal artery and the urine. Fewer were able to calculate the percentage increase. The most common incorrect response was 99 per cent and where candidates had divided the difference by the value of the solute concentration of the urine rather than dividing by the solute concentration of the blood in the renal artery.

(ii) It was evident that not all understood the type of response required for a 'describe' question. Some tried to explain the similarities and differences in concentration by referring to absorption and filtration. The question required a description of the results. This required more than simply quoting data straight from the table. The best responses described the concentration of salts being the same in the blood, in the renal artery and in the fluid of the kidney tubule and that the concentration of salts increases in the urine.

(iii) Many candidates could correctly state that proteins would be too large to enter the fluid in the kidney tubule.

(iv) Many candidates could correctly state that glucose is reabsorbed.

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(d) A few excellent descriptions of the advantages of kidney transplants were seen. The best responses referred to the lack of restrictions on diet and lifestyle. Some included the idea of a transplant being more cost effective in the long run with most correctly describing a transplant as being more convenient than frequent dialysis.

Question 2

(a) (i) The question required **visible** features. General features of insect-pollinated plants that were not visible were not required.

(ii) A few responses gave details of plant fertilisation rather than pollination. The majority of candidates identified that self-pollination occurred in the same plant.

(iii) Candidates found this question more challenging depending on their approach. It was evident that many confused self-pollination with asexual reproduction and gave the advantages of asexual reproduction. This was not usually successful. The best responses included the ideas that there were more chances of pollination and fertilisation and this is useful if the plant is geographically isolated, thus preventing extinction.

(b) (i) Most candidates had some correct ideas about co-dominance, with the majority of candidates stating that both alleles are expressed. It was pleasing to see that there was very little confusion between the terms genes and alleles. Fewer referred to the phenotype being intermediate.

(ii) There were many excellent genetic diagrams seen. The most common error was to give a ratio without any reference to the phenotype so it was not clear which colours the candidates were referring to.

(iii) A common error was to state the genotypes rather than the phenotypes. Most candidates were able to gain the second mark available by describing the inheritance of a C^W and a C^R allele or referring to the offspring all being heterozygous.

Question 3

(a) Most candidates could state the correct sequence of a reflex action. A common error was to reverse the order of the relay and the motor neurone.

(b) Most candidates were able to name neurotransmitters and their release from vesicles and subsequent diffusion across the synapse. A significant number referred to the binding of the neurotransmitter with receptor **cells**. This was a common misconception. In a small number of cases there was some confusion between the electrical impulses and the chemical neurotransmitter, with some using these terms interchangeably.

(c) (i) Many candidates could state at least one effect of heroin use. A few gave long-term effects or the effects of withdrawal which did not answer the question.

(ii) This question was well-answered with many candidates able to give two correct withdrawal symptoms.

(iii) Many candidates suggested that people turned to crime to finance their addiction.

Question 4

(a) This question was well-answered. Some candidates gave natural sources of the chemical substances stated rather than sources of pollution caused by humans which was not accepted.

(b) (i) Candidates should be congratulated as many excellent and clear responses were seen. Most candidates could give a detailed explanation of how eutrophication was caused referring to the causes of the death of plants, the aerobic respiration of decomposers and the death of organisms due to lack of oxygen. A minority mistook algae for decomposers and stated that algae were responsible for the reduction in the oxygen concentration in the water. A very small number of candidates suggested that death of marine organisms was caused by toxicity of the fertilisers entering the lake which did not answer the question.

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(ii) Most candidates suggested using less fertiliser. Several additional good suggestions were seen such as not applying fertiliser during the rainy season.

Question 5

(a) (i) This question required a description of the data and an explanation. A few attempted an explanation of the data but did not refer to the data explicitly and responded in abstract terms. Some simply gave data quotes without any form of description or explanation. The best responses referred to the loss of mass of the leaves and related this to thickness of cuticle and loss of water by transpiration. A few calculated the loss in mass but these values were often inaccurate due to misreading the data from the graph.

(ii) Many candidates could relate that an increase in humidity would decrease the transpiration rate and so less water and mass would be lost. Some tried to relate this to water potential, which was not required. One misconception was to state that an increase in humidity would increase the transpiration rate.

(b) Many candidates gave two correct adaptations. A common error was to give adaptations of hydrophytes instead of xerophytes.

(c) (i) This was answered very well with most candidates stating the correct raw material.

(ii) A common error was to refer to the processes rather than substances that glucose is converted to. A common misconception was that respiration produces rather than releases energy.

Question 6

(a) (i) This question was generally well-answered. A common error was to identify the protein coat as the cell wall or membrane. Occasionally the answer for X was given for Y and vice versa.

(ii) A few responses seemed to refer to fungi rather than bacteria. The question referred to differences in structure, responses stating differences in reproduction methods were not accepted. A common error was to describe bacteria as having a nucleus.

(b) (i) The most common error was to give two methods of direct transmission. Most candidates were able to give at least one example of indirect transmission.

(ii) This question was generally well-answered. Occasionally candidates incorrectly gave chemical or cellular examples of barriers to infection. A common misconception was for candidates to refer to cilia in the nose rather than nasal hairs.

(c) The difference between the terms antibodies, antigens and pathogens was not clearly understood by all. A significant number of responses described antibodies as making lymphocytes and phagocytes to destroy pathogens. Some responses described antigens as being made by antibodies. The best responses identified that antibodies bind to specific antigens on the pathogens surface and destroy them. The additional role of phagocytes was generally not well explained with few stating that antibodies marked pathogens for destruction by phagocytes. A number of candidates described the antibodies engulfing pathogens, which was not accepted.

(d) Most candidates could describe some differences between active and passive immunity. Most candidates referred to the length of immunity and the production of memory cells. It was pleasing to see that only a handful of responses were unclear as to the difference between active and passive immunity. Some responses described how active immunity worked rather than the difference between active and passive immunity.

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BIOLOGY

Paper 0610/52
Practical Test

Key messages

Candidates should have plenty of experience of the practical procedures outlined in the syllabus. It is important that they can plan investigations, identify variables and sources of error.

Candidates should be familiar with performing calculations and should remember to show their working.

A sharp pencil should be used for drawings and graphs.

General comments

Many excellent responses were seen which showed a good understanding of practical procedures.

Comments on specific questions

Question 1

(a) (i) Most candidates were able to construct a table with the correct number of rows and columns to report all the relevant data. A few responses did not include column headings or did not use the correct intensity scale.

(ii) Most candidates gave the correct response. The most common error was to identify the variable that was changed.

(iii) This proved to be a challenging question for some candidates. It was important that the error was paired with the improvement. The most common correct response was that the same glass rod was used for all the beakers and this would lead to contamination of the solutions.

(iv) Many identified the unwashed cloth as being a control but the explanation lacked sufficient detail and was not specific to the experiment. The best responses went on to explain that a control is used to compare the effect of the solutions on the cloth. A common error was to state a variable that should be kept constant i.e. a controlled variable rather than identify a control in the experiment.

(v) In general, this was well-answered. Candidates were able to discuss the idea that the colour would need to be judged and that this was subjective.

(b) (i) It was lovely to see that so many candidates were able to identify the independent variable for this experiment.

(ii) A common error was to explain enzyme action in great detail, without considering the information given in the question. The commonest correct response was that the areas that were stained blue-black contained starch, whilst those that remained brown, did not have starch.

(iii) Most candidates were able to draw a suitable graph. The most common error was extrapolating the line beyond the first or last plotted points. A less common error was to omit the units for the axes.

(iv) This question was answered well by most candidates. They discussed the trend in the data and supported this by quoting suitable data points with units.

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(v) It was clear that most candidates were able to identify additional measurements for the experiment. Many correctly stated that smaller intervals of temperature should be measured but fewer were able to correctly match this with the 40–50 ˚C range.

Question 2

(a) (i) Some excellent drawings of the lung tissue were seen. Common errors included diagrams that were so large that they went into the printed text and the addition of shading.

(ii) Most were able to correctly measure the length of the line. Many were able to correctly calculate the magnification. The most common errors were not rounding to the nearest whole number or not drawing a line on their diagram.

(iii) The majority of responses gave three correct differences. It was not clear in some responses as to which image they were referring to, in these cases examiners had to assume that the response referred to the healthy tissue.

(b) (i) The large number of correct responses in identifying a suitable hazard was very encouraging.

(ii) Some candidates could correctly identify another substance that could be used to determine the concentration of carbon dioxide. A range of indicators were accepted with the most common choice being hydrogencarbonate indicator.

(iii) Those candidates who were confident in handling data and ratios were able to calculate the concentration of carbon dioxide easily. A few did not show their working. This meant that they were not able to obtain credit for their processing where their final answer was incorrect.

(c) A number of very thorough investigations were planned with many gaining maximum credit. Almost all candidates were able to describe that they would use the apparatus before and after exercise and record the time for the limewater to go cloudy. Most also recognised the need to keep at least one variable the same and also suggested that the experiment should be repeated many times or should involve numerous participants. A common error was to omit a suitable type of exercise. Safety precautions that related directly to their procedure gained credit but too often general statements were made, for example use of lab coat and tying back hair. Some responses recognised the opportunity to use refine the method to judge ‘cloudiness’ and these were credited.

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BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

Candidates should have plenty of experience of the practical procedures outlined in the syllabus. It is important that they can plan investigations, identify variables and sources of error.

Candidates should be familiar with performing calculations and should remember to show their working.

A sharp pencil should be used for drawings and graphs.

General comments

Almost all candidates answered all the questions fully and many excellent scripts were seen. Making and recording observations from images (**2(a)(i)**), suggesting improvements to a method (**1b(v)**) and evaluating procedures (**1(a)(iv)**, **1(a)(vi)**, **2(b)(i)**) were the skills that seemed to be the most challenging.

Comments on specific questions

Question 1

(a) (i) Most candidates were able to construct a table with the correct number of rows and columns to report all the relevant data. A few responses did not include column headings or did not use the correct intensity scale.

(ii) The majority of candidates identified the correct variable. Common errors were temperature and enzymes.

(iii) Almost all candidates were able to state a variable that was kept constant in this investigation.

(iv) This proved to be a challenging question for some candidates. It is important that the error is paired with the improvement. The most common correct response was that the same glass rod was used for all the beakers and this would lead to contamination of the solutions.

(v) Most candidates recognised one of the control experiments, but they did not always explain why they had chosen it. There were incorrect references to time and the amount of washing powder. This question provides an example of a situation where candidates must provide convincing supporting evidence. Simple statements such as 'to compare results' were insufficient, better responses went on to explain that a control is used to compare the effect of the solutions on the cloth.

(vi) Fewer responses were able to describe a reason why the results determined in step 7 might not be accurate. Mostly commonly responses referred to the subjectivity associated with judging intensity by eye, but a range of other acceptable reasons were also seen.

(b) (i) Most candidates were able to identify temperature as the variable that was changed in this investigation.

(ii) Most candidates were familiar with the results of the iodine test and were able to apply their knowledge to this context although a small number of candidates gave incorrect food groups associated with the iodine test. A number of candidates extended their answers to include some

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theory of enzyme activity, even though an understanding of the associated theory is not required in this paper.

(iii) Most candidates were able to draw neat, accurate graphs. The most common errors were to extrapolate the line to the origin, or to omit the units on the axes titles. A less common error was to use a scale that was too small so that less than half the available grid space was used. Those who chose non-standard scales (increments of 3, for example) increased their chance of a plotting error.

(iv) Many very detailed descriptions of the trends in the data were seen which was pleasing. Errors included omitting the units when quoting key data points or misinterpreting the temperature at which a decrease in the area started as 60 °C rather than 50 °C. A large number of candidates referred to rate of enzyme activity rather than referring to diameter.

(v) The best responses stated that more measurements between the temperature range where the highest diameters had been recorded (i.e. 40 – 50 °C) would be required to determine the optimum temperature. Common incorrect responses included using a thermometer, checking pH and repeating the whole experiment.

Question 2

(a) (i) Some excellent drawings of the lung tissue were seen. Common errors included diagrams that were so large that they went into the printed text and the addition of shading.

(ii) Almost every candidate was able to correctly measure the length of the line. A minority omitted the unit or gave an incorrect unit. A few did not include the line CD on their drawings. A considerable number did not give their answer to the magnification calculation to the nearest whole number.

(iii) Many candidates found it challenging to describe three differences between the lung tissue of a healthy person and a person with COPD. Where candidates did not write which of the two images they were describing, examiners had to assume that the response referred to healthy tissue. A less common error was to identify each alveolus as a cell and make incorrect reference to features such as ribosomes and cell walls.

(b) (i) Many candidates were able to identify a correct possible hazard.

(ii) The most common correct substance that could be used as an alternative to limewater was hydrogencarbonate indicator. The most common incorrect responses included hydrogen peroxide, sodium hydroxide and calcium hydroxide.

(iii) Those candidates who were confident in handling data and ratios were able to calculate the concentration of carbon dioxide easily. A few did not show their working. This meant that they were not able to obtain credit for their processing where their final answer was incorrect.

(c) A number of very thorough investigations were planned with many gaining maximum credit. Almost all candidates were able to describe that they would use the apparatus before and after exercise and record the time for the limewater to go cloudy. Most also recognised the need to keep at least one variable the same and also suggested that the experiment should be repeated many times or should involve numerous participants. A common error was to omit a suitable type of exercise. Safety precautions that related directly to their procedure gained credit but too often general statements were made, for example use of lab coat and tying back hair. Some responses recognised the opportunity to use refine the method to judge 'cloudiness' and these were credited.

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