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BIOLOGY

Paper 0610/12
Multiple Choice (Core)

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

General comments

There was good understanding of: the characteristics of mammals; calculating magnification and the role of enzymes.

There was some uncertainty about: partially permeable membranes; what is transported in the phloem and the uses of energy released in respiration.

It is important for candidates to work carefully and methodically through information provided in the question, such as in **Question 34**.

Comments on specific questions

Question 7

Many candidates knew that carbon dioxide will diffuse into the leaf through the stomata on a sunny day. This is necessary for photosynthesis to take place. Some candidates incorrectly believed that carbon dioxide diffuses out of the leaf on a sunny day.

Question 8

This proved to be a demanding question with the many candidates incorrectly identifying the cell wall, option **A**, as the partially permeable membrane. The partially permeable membrane is the cell membrane, option **C**.

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Question 9

Few candidates knew that when testing for the presence of vitamin C, the reagent changes from blue to colourless and no heating is required.

Question 11

While many candidates knew the correct features of enzymes, some did not recall that because they are proteins, they contain nitrogen.

Question 12

Many candidates were able to apply their knowledge of photosynthesis to correctly identify that the green areas that are exposed to light will contain starch. The commonest incorrect response was option **C**, suggesting that some did not recall that both light and chlorophyll (in the green areas) are needed to produce starch. Or they did not recall that blue-black is the positive test colour for the starch test.

Question 13

Many candidates correctly identified the guard cell, option **D**. The commonest incorrect response was the epidermal cell.

Question 15

Many candidates knew that the ileum has a large surface area for the absorption of digested food. The commonest incorrect responses were liver or pancreas.

Question 17

While many candidates correctly selected option **B**, many did not. Options **A**, **C** and **D** all involve liquid water, not water vapour.

Question 18

Some were able to recall that sugar is transported in the phloem. The most common incorrect response was starch. Starch is a large insoluble molecule which is not transported in the phloem.

Question 20

Many candidates recalled that the blood vessel that returns blood from the lungs to the heart is the pulmonary vein. The pulmonary artery was the commonest incorrect response.

Question 23

Many candidates knew that features of the gas exchange surface in humans include a large surface area and a thin surface. Some candidates mistakenly believed that the gas exchange surface is thick.

Question 24

When yeast is placed inside a container of glucose solution with no air, the conditions are anaerobic, so the word equation which summarises the process that takes place inside the container is:

glucose → alcohol + carbon dioxide.

Some candidates appeared unsure about the products of anaerobic respiration in yeast and incorrectly selected the equation for anaerobic respiration in muscle cells: glucose → lactic acid.

Question 25

This proved to be a demanding question with each option being selected by many candidates. Of the processes given, only growth uses energy released in respiration.

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Question 33

Some candidates correctly recalled the conditions required for germination. A few incorrectly thought that carbon dioxide is needed for germination, but oxygen is not needed.

Question 34

This was a demanding question. Individual 5 must be homozygous recessive because they have the disease and yet their parents do not have the disease, therefore individual 1 must be heterozygous as they do not have the disease but one of their children does have the disease.

Question 35

Many candidates knew that the flowers in the photograph had small petals, anthers positioned outside the flower and feathery stigmas. Some candidates incorrectly believed that the flowers had anthers positioned inside the flower.

Question 36

Most candidates understood that the process involved in the development of a specialised beak is natural selection. Some incorrectly opted for selective breeding, forgetting that this involves human intervention.

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BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

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

General comments

There was good understanding of: the structure of DNA; the role of enzymes; gas exchange surfaces and the use of energy released in respiration.

There was some uncertainty about: prokaryote structure; blood clotting and sustainable forestry.

It is important for candidates to work carefully and methodically through information provided in the question, such as in **Question 11** and **36**.

Comments on specific questions

Questions 2

This question was answered well, although some candidates were uncertain as to whether protoctists or prokaryotes possess a nucleus. Prokaryotes do not possess a nucleus.

Question 5

Many candidates knew that carbon dioxide will diffuse into the leaf through the stomata on a sunny day. This is necessary for photosynthesis to take place. Some candidates incorrectly believed that carbon dioxide diffuses out of the leaf on a sunny day.

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Question 7

Most candidates knew that when testing for the presence of vitamin C, the reagent changes from blue to colourless and no heating is required.

Question 11

Many candidates were able to apply their knowledge of photosynthesis to correctly identify that the green areas that are exposed to light will contain starch. The commonest incorrect response was option **C**, suggesting that some did not recall that both light and chlorophyll (in the green areas) are needed to produce starch. Or they did not recall that blue-black is the positive test colour for the starch test.

Question 12

Many candidates understood that the environmental factor limiting the rate of photosynthesis at X on the graph was option **B**, light intensity. Some candidates incorrectly opted for option **A**, carbon dioxide concentration. Light intensity is the limiting factor until the graph line plateaus.

Question 15

While many candidates correctly selected option **B**, many did not. Options **A**, **C** and **D** all involve liquid water, not water vapour.

Question 18

Many candidates understood the events that occur during blood clotting. Some candidates were unsure whether fibrinogen is converted to fibrin or whether fibrin is converted to fibrinogen. During blood clotting, fibrinogen is converted to fibrin.

Question 21

Many candidates knew that features of the gas exchange surface in humans include a large surface area and a thin surface. Some candidates mistakenly believed that the gas exchange surface is thick.

Question 31

Many candidates correctly identified the curve on the graph which represents the hormone LH. For LH, there is only one peak, and it occurs just before ovulation.

Question 32

It was understood by many candidates that the mass of DNA doubles in a nucleus before mitosis. Some candidates incorrectly believed that the mass of DNA in a nucleus stays the same.

Question 36

Many candidates used their understanding of reproduction to deduce the diploid number of the hybrid zygote.

Question 40

Many candidates appreciated the activities which are likely to ensure the forest is used sustainably. Some candidates did not understand that cutting down only selected trees is part of ensuring the forest is used sustainably.

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BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

Candidates should ensure that they read each question carefully and answer the question being asked. Candidates sometimes see one or two key words and write everything they know about that topic, much of which does not answer the question and cannot be credited.

Command words such as describe, explain, suggest and compare require different responses from candidates. If a description is required, including a reference to a graph or table, then it is expected that data will be used in the description given. Many candidates can do this effectively. An explanation requires more than just a description and candidates should be encouraged to practise the difference between explain and describe.

General comments

Many candidates showed a good understanding of biological processes in their answers. They were able to communicate their responses clearly. There was evidence of a wide variety of knowledge and understanding of all parts of the syllabus and an ability to apply different skills depending on the question demand.

Many candidates showed good factual knowledge. They should be reminded that they need to carefully read the stimulus material provided for each question and complete all the instructions contained within each part question to maximise their chance of success.

Comments on specific questions

Question 1

(a) The majority of candidates knew that genetic material is in the nucleus of a cell and could recognise this structure on the photomicrograph. A small number did not gain the label mark as their label line ended in the area around the nucleus and not directly on it.

(b) Nearly all candidates knew that the instrument to use was a microscope. The suggestion of a magnifying glass or a telescope was not acceptable.

(c) The differences between animal and plant cells were well-known and the majority gained both marks. Some candidates often gave one valid response. The question asked for structures so chlorophyll could not be credited.

(d) (i) The majority of candidates knew that **X** represented a cell membrane. Some incorrectly identified **X** as the cell wall or barrier.

(ii) Many candidates drew an arrow in the correct direction. Some candidates incorrectly drew one arrow going from right to left, or drew many arrows, possibly indicating Brownian motion.

(iii) A number of candidates had difficulty in naming the process. Many stated osmosis, possibly because they were familiar with this process in the presence of a membrane. Another common answer was respiration, presumably triggered by the fact that oxygen was involved.

Question 2

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(a) Many candidates were awarded all four marks. Structure **A** (the prostate gland) and **B** (the testes) were more frequently linked to an incorrect function than were structure **C** (the urethra) and structure **D** (the ureter).

(b) (i) The majority of candidates knew that the testes produce testosterone.

(ii) Many candidates struggled to explain why the testes are classified as organs. Stronger responses stated that the testes were composed of tissues, but not that these tissues acted together to perform a specific function. Weaker responses tended to refer to the testes being important in reproduction.

(c) Nearly all candidates could state two characteristics of living organisms, other than reproduction. The most frequent error was to list breathing and digestion as characteristics.

(d) When three marks are allocated to a question, three distinct points must be made. Many candidates did not give three differences between sexual and asexual reproduction. Where candidates refer to offspring being different to each other or different to the parents, they should state that this difference is genetic. A great many candidates dealt with this point imprecisely. Answers also revealed that many candidates believed asexual reproduction is confined to plants. Candidates should be aware that many invertebrates also use asexual reproduction.

Question 3

(a) (i) The position of the septum in the heart was not well-known. Many candidates did not attempt an answer. A point to note is that papillary muscle, whilst attached to the septum, does not constitute the septum itself.

(ii) Some candidates knew that blood vessel **Y** was the pulmonary vein. Others identified it as the pulmonary artery or, less frequently, as the aorta or the vena cava.

(iii) Many candidates found this question challenging, mainly because they misidentified the labelled structure as either the right atrium or the right ventricle. Many of those who realised that it was a valve gave insufficient detail for its function, saying that it controlled the flow of blood, but did not say that it prevented the blood flowing backwards.

(iv) A few candidates gave a correct response. The most common misconception being that a noise is created whenever the valve opens, as well as when it closes.

(v) Many candidates knew that the heart wall is composed mainly of muscle. A significant number gave the answer cardiac tissue which was not acceptable.

(b) (i) All candidates performed well on interpreting the graph and completing the sentences.

(ii) The majority of candidates read the required heart rate from the graph accurately.

(c) (i) Coronary arteries were not well-known.

(ii) Many candidates did not know what was meant by risk factors. Many respond by stating the consequences of having a blockage in the coronary arteries. There was a tendency for the answers to be too vague. For example, blood pressure or drinking are not risk factors, whereas high blood pressure and drinking excessive alcohol are.

(iii) Almost all candidates could give the names of two cells found in blood. Red blood cells and white blood cells were the usual answers, with platelets appearing less frequently. A few candidates incorrectly stated plasma as one of their choices.

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Question 4

(a) (i) The rate of movement was calculated accurately by many candidates.

(ii) Many candidates calculated the distance accurately.

(iii) Most candidates recognised that oxygen was being taken in by the arthropod. Weaker responses suggested the gas was nitrogen, carbon dioxide or potassium hydroxide.

(iv) The majority of candidates recognised that the water-bath was used to keep the temperature constant. Where two boxes were ticked, no credit was given.

(b) (i) Most correctly identified water as the other product of aerobic respiration. Some had not read the question precisely and gave the answer as carbon dioxide.

(ii) Excretion of carbon dioxide by the lungs was well-known, although a significant number stated the nose, mouth, or some other part of the respiratory system as the excretory organ.

(c) Candidates experienced difficulties in supplying correct words to fill the gaps. Few candidates stated contraction for muscles, with many opting for movement. 'Impulses' was stated by greater numbers, although quite a few incorrectly used the terms signals or messages. Neurones was the correct response stated by the greatest number of candidates.

Question 5

(a) (i) This question proved demanding for many candidates. Very few candidates correctly identified the cuticle and the phloem. Spongy mesophyll and stoma were correctly identified more frequently. Some candidates seemed not to recognise that the drawing was a section through a leaf as their answers were for parts of a cell.

(ii) Few candidates identified the four guard cells accurately. The majority thought that every epidermal cell was a guard cell and gave the answer as 8 or 17 depending on whether they counted the upper epidermis cells as well as the lower epidermal cells.

(b) (i) Most candidates knew that the xylem transported mineral ions.

(ii) Root hair cells were also well-known. Those candidates who wrote root cells were not given credit.

(iii) The most commonly gained marks were for knowing that the process was transpiration and that the water vapour left the leaves via the stomata. The word evaporation was commonly used, but unless it was stated that the evaporation was from the surface of spongy mesophyll cells, no credit was given. Many candidates described the movement of water from entering the root hairs to its final exit from the leaves. Often, these candidates gave insufficient detail about the loss of water from the leaves.

(c) (i) Most candidates could state the word equation for photosynthesis. A balanced chemical equation was acceptable, but those who attempted this often made an error.

(ii) The necessity of light energy for photosynthesis was well-known. Sunlight was accepted as an answer, but not solar energy as the latter contains both heat and light energy.

Question 6

(a) (i) Nearly all candidates read the graph correctly.

(ii) Many candidates stated correctly that the stain was removed in the shortest time at 40°C or used words to that effect. Other candidates commonly described 40°C as the optimum temperature, but this did not answer the question.

(iii) Many candidates correctly selected which of the conclusions were valid.

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(b) The most common answer given was pH. A significant number of candidates stated concentration but could not be given credit as they did not say whether this was concentration of the substrate or of the enzyme.

(c) The majority of candidates knew that a catalyst increases the rate of a reaction and so were awarded the first mark. Some did not add anything further. The idea that the catalyst was not permanently changed at the end of the reaction was not expressed clearly by many candidates. It was common for a candidate to state that the catalyst was not involved in the reaction, which is incorrect for an enzyme.

(d) The enzyme was frequently identified correctly. Many candidates struggled to identify the substrate and often several letters were given in the answer, such as **V** and **W** or **X** and **Y**.

(e) The substrate and the products of a reaction involving lipase were well-known.

Question 7

(a) (i) The majority answered this accurately.

(ii) This was also answered accurately by most, but not as well as for **(a)(i)**.

(iii) Most candidates gave the correct percentage.

(b) The chief distinguishing feature of birds is that they have feathers. The fact that they have wings and so can fly is not a unique feature as bats also have wings and use them to fly. Some of the candidates knew other distinguishing avian features, such as the possession of a syrinx, or the presence of pneumatic bones, and these were credited.

(c) The majority of candidates could cite two ways of preventing plastic entering the environment. Unacceptable responses included not throwing plastic on the ground, burning the plastic, and grinding the plastic into small pieces.

(d) The majority answered the question well and frequently gained three or four marks. The tendency was to write at length about one or two ways to conserve endangered species and this limited the credit which could be given. Despite the wording of the question, a significant number of candidates based their answers on reduction in pollution, including global warming and rising sea levels.

(e) The question on natural selection was answered well with most candidates gaining at least two marks.

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BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

Many candidates displayed a high standard of scientific knowledge and understanding. They should be congratulated for their articulate and accurate responses.

Understanding the differences in the responses required by different command words is important in enabling candidates to access the available marking points for each question. In particular, the command words of describe and explain require different responses and candidates often provided descriptions of data, when an explanation of the data is required. This was evident in **Questions 1(c)(ii)** and **3(a)(i)**.

Mathematical skills were high in the responses seen. However, some candidates would benefit from practising reading and manipulating data from more complex graphs including those with different axes, scales, and data sets. These skills were required in **Questions 5(b)(i)** and **5(b)(ii)**.

It is important for candidates to understand differences between key terms used in the syllabus and to be able to use these key terms in their responses. Key words such as antibiotic, antigen, antibody and allele have quite different meanings and were not understood by some candidates. This was particularly evident in **Question 4(b)(ii)**. Understanding the differences between DNA, mRNA and gene were important in **Questions 6(b)(i)**, **6(b)(ii)** and **6(b)(iii)**.

General comments

There were many examples of vague responses which prevented some candidates from accessing all the available marks. Candidates should be encouraged to be specific in their responses, using suitable scientific language in order to describe and explain phenomena accurately and in suitable depth. The number of available marks for each question can act as an indicator in how many specific points the response requires.

It is important for candidates to read all the stimulus material carefully and complete all the instructions contained within the question. There were occasions where candidates could not access all the marks available or gave irrelevant responses due to not reading the question thoroughly or answering a question of their own devising.

Some areas of the syllabus were better known than others. Candidates should be reminded to revise all the material detailed in the syllabus. A useful tool is to use the syllabus as a revision guide and encourage candidates to go through the syllabus ensuring that they have covered each learning objective in their revision.

Comments on specific questions

Question 1

(a) (i) Many candidates identified the alveoli as the gas exchange surface in humans. Lungs was frequently seen but was not specific enough to be credited. Some candidates stated processes, for example breathing and respiration, rather than the name of the surface.

(ii) Many candidates could state different features of gas exchange surfaces. Occasionally candidates were too vague in their responses. Responses such as a good transport system were not creditworthy. Candidates should specifically refer to the possession of a good blood supply or the gas exchange surface being surrounded by capillaries. A number of candidates gave the function of gas exchange surfaces rather than the features.

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(b) (i) An external intercostal muscle was generally labelled correctly. Occasionally there were inaccuracies in candidates labelling, with the label line stopping short of the external intercostal muscle. Candidates should be encouraged to take care when drawing label lines, ensuring they use a ruler and touch the structure that they are intending to label. Very occasionally, incorrect structures were labelled, including the lungs and the diaphragm.

(ii) Most candidates could state the function of the cartilage rings. However, fewer were able to state the correct name. Incorrect references to diaphragm, larynx and bronchi were frequently seen. The best responses identified the function as support of the trachea. Vague references to protection could not be credited.

(iii) Candidates should be reminded to read the question carefully. This question only asked for the effect of contraction of the diaphragm on the thorax. Many candidates described the entire process of inhalation, which was unnecessary. Some candidates did not gain credit as they referred to the effect on lung volume instead of thoracic volume.

(c) (i) This question was answered well with nearly all candidates able to identify oxygen and carbon dioxide gas. Identification of water vapour proved more problematic, with a wide variety of incorrect answers seen including argon, other gases, sulfur dioxide and nitrogen.

(ii) The command word for this question was explain. A significant number of candidates simply described the data for gas **B** and gas **C**, which was irrelevant. The best responses explained that gas **B** was required for the process of respiration and that gas **C** was a product of this process. Some candidates explained in terms of diffusion of the gases down a concentration gradient between the alveoli and the capillaries (or vice versa), which was acceptable. However, to gain all the available marks, candidates were required to explain the reason for the difference in percentage by referring to the process of respiration.

Question 2

(a) There were many high scoring and detailed responses seen. Candidates had a good understanding of the adaptations of sperm and egg cells and were able to express their ideas clearly, with many gaining full credit. Occasionally a few candidates misinterpreted the question and described the process of fertilisation and the early development of an embryo. Common misconceptions included that the mitochondria produce energy rather than release energy and that the acrosome is a digestive enzyme. Some candidates needed more detail in their responses, with some referring to sperm cells having mitochondria, rather than specifying a large number of mitochondria.

(b) (i) Most candidates gave a basic outline of artificial insemination, but many were lacking in detail. The most commonly seen marking points were the extraction of sperm and insertion into the uterus. Some candidates described the insertion of sperm into the oviduct. Few candidates provided the additional detail required to access all the available marks. Occasionally, there was some confusion between *in vitro* fertilisation and artificial insemination.

(ii) Most candidates could describe two differences between *in vitro* fertilisation and artificial insemination. The most common answers included that fertilisation occurs outside of the female body and that egg extraction is also required. A common misconception was that the resultant zygote is inserted into the uterus rather than insertion of an embryo. There were also a significant number of candidates that felt the process of *in vitro* fertilisation used the father's sperm whereas artificial insemination used another male's sperm. Whilst this can happen, this is not always the case and so cannot be considered a difference between the two processes.

(iii) Many candidates found this question challenging, with evidence that some did not have a clear understanding of the term social implications. Some candidates confused fertility treatment with contraceptives and described associated pollution issues. The best responses gave several positive and negative social implications including references to expense, multiple births, allowing infertile couples to have children and religious and ethical issues. A number of candidates focussed on just one implication such as societal stigma and explained this in detail. Candidates should be reminded to use the mark allocation as a guide to the number of relevant, different points they need to make.

Question 3

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(a) (i) Many candidates misinterpreted the command word and gave a full description of the results, which was unnecessary. The best responses related the loss of mass at increasing temperature to the effects on the water molecules. Many candidates did not qualify their answers by stating that more evaporation and more diffusion of water vapour would occur at higher temperatures. Occasionally candidates tried to explain the results in terms of enzyme activity or changes to rate in photosynthesis, which were rarely successful.

(ii) A correct answer of humidity was frequently seen. Other correct answers, such as differences in windspeed and light intensity, were also acceptable.

(b) (i) The correct answer of xylem was commonly seen. A significant number of candidates identified this as a blood vessel, despite being told in the stimulus material that this was a photomicrograph of a plant tissue.

(ii) The adaptations of xylem were not well-known. There were some inaccuracies in candidate's responses referring to the lack of cell walls, rather than the lack of end walls. A number of candidates recognised that the xylem was hollow, contained no cell contents but did not relate this to providing less resistance to water. Some candidates confused xylem with phloem, giving the adaptations of the latter. A number of candidates incorrectly described the use of valves in xylem.

(c) This question was answered well with many candidates gaining all the available marks. There was occasionally some confusion evident between the processes of osmosis and diffusion.

Question 4

(a) (i) There were many excellent responses seen, with most candidates gaining full credit. Common misconceptions were that bacteria do not possess DNA and that palisade mesophyll cells do not contain ribosomes. Some candidates were not detailed enough in their responses for the differences and simply stated various cell structures and did not refer to whether the cell structures were found in the palisade mesophyll cell or the bacterial cell.

(ii) Some candidates were able to provide extremely detailed and accurate responses. A common misconception was that the cholera bacteria released chloride ions or that chloride ions are toxic. Some responses lacked detail and simply described diarrhoea. Candidates should be reminded to use the correct scientific terminology when explaining phenomena. The best responses were able to explain in terms of changes in the water potential in the lumen of the intestine.

(b) (i) Most candidates provided a suitable explanation in terms of radius of the clear area, where there was no bacterial growth. Occasionally some candidates were imprecise referring to a large area rather than the largest clear zone.

(ii) The topic of the development of antibiotic resistance in bacteria was not well-known by candidates and this question proved problematic for many. It was evident that there was much confusion between immunity, antibiotics, antigens, and antibodies. A major misconception is that exposure to antibiotics causes mutation which results in antibiotic resistance or that bacteria change in order to adapt to resist antibiotics. This is incorrect. The best responses highlighted that random mutations led to variation in the bacterial population and described the resulting natural selection when this population was exposed to antibiotics. The best responses described the inheritance of resistant alleles being passed down when bacteria reproduce, rather than traits or characteristics.

(iii) This question was answered well with most candidates describing reducing the use of antibiotics or completing the full course as a way of minimising the risk of developing antibiotic resistance in bacteria.

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Question 5

(a) The majority of candidates followed the rubric and stated two visible features, using the photographic evidence provided. The feature required was external ears, unqualified references to ears were ignored. However, the correct visible features of mammals were frequently seen. Occasionally other mammalian features were stated that were irrelevant such as mammary glands, four limbs, horns, and spinal cord. These responses could not be credited.

(b) (i) Most candidates displayed their working and expressed their calculated value to three significant figures. Occasionally there were inaccuracies in candidate's graph reading skills. Some candidates calculated a percentage rather than a percentage increase, others divided the difference by 260 rather than 75. When reading from a graph with two axes with different scales and two different sets of data, it is important to ensure that reading is done from the correct axes, considering the scale and that the correct data set is being used.

(ii) There were some excellent descriptions of the data, with the best responses referring to the change in the rate of population increase or decrease. Candidates should be reminded to quote values accurately from the data, in this case both the population number and year were required for many of the marking points. Correct manipulation of data was also credited. Occasionally inaccuracies were seen in reading the wrong data set or using the wrong axis.

(c) Most candidates were able to describe several conservation measures that could have been used to increase the population of Arabian oryx including captive breeding, conservation parks, education, and a ban on hunting. A few candidates describe selective breeding rather than captive breeding.

(d) Several candidates misinterpreted the question and instead tried to explain the risks of an increasing population size. Responses of this type were not credited. Many candidates tried to explain why the population numbers had fallen so low. Most candidates recognised that the population of northern white rhinoceros were at risk from extinction. The best responses went on to explain the risks to having such low population numbers in terms of lack of genetic diversity, inbreeding and risk of genetic disease.

Question 6

(a) The function of pepsin was well-known, as was the site of action. The function of trypsin was less well-known with a number of candidates suggesting its function as the digestion of fats into fatty acids and glycerol. Amylase was frequently given instead of maltase. Candidates should be reminded to read table headings carefully. The table required the site of action of the enzymes rather than the site of production.

(b) (i) Most candidates identified **C** as a ribosome. **A** proved more difficult to identify for candidates with many references to DNA and mRNA rather than gene or allele.

(ii) Most candidates provided succinct and accurate answers. Some added further detail about translation, which was beyond the scope of the syllabus and unnecessary for answering the question. Occasional inaccuracies were seen such as reference to mRNA entering the nucleus or DNA leaving the nucleus.

(iii) Candidates needed to be precise in their responses to gain this mark. Candidates should have referred to the sequence of bases on the mRNA. Some candidates simply referred to the bases in an mRNA molecule. Alternatively, some referred to the base sequence but did not specify which molecule they were referring to.

(c) Candidates recognised the importance of shape in terms of enzyme action. However, a number did not mention the active site, with the majority referring to the importance of shape in the formation of an enzyme-substrate complex. There was some confusion evident as some did not seem to know that enzymes are proteins.

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BIOLOGY

Paper 0610/52
Practical Test

Key messages

Candidates must ensure that they read questions carefully before starting to answer. This is particularly important for the planning exercise. Identification of the dependent and independent variables is vital before a plan is completed. The variables that need to be kept constant must also be considered and included in a plan.

Candidates should be reminded not to shade their drawings and to use clear, unbroken lines.

General comments

Many candidates performed very well on the calculations. The data table and graph were drawn well by most candidates. Some candidates confused significant figures with decimal places.

Comments on specific questions

Question 1

(a) (i) Many candidates were awarded full marks for drawing a suitable table. In some cases, candidates recorded their values in both minutes and seconds. The question specified that the times should be recorded in seconds.

(ii) The vast majority of candidates stated a suitable conclusion.

(iii) In general, this was answered well. Candidates were able to correctly identify the size of the agar block as being the independent variable.

(iv) Most candidates were able to identify two variables that were kept constant in the investigation. Many candidates correctly identified the volume or concentration of hydrochloric acid or the type of indicator. A small number of candidates stated temperature, which was not accepted as they did not actively control this themselves in the experiment.

(v) Many candidates found it difficult to identify two improvements to the method. The most common error was listing several variables that were kept constant or cutting the block more carefully. It is important that candidates practice the skills needed to analyse a given method. The most common correct answers were repeating the investigation and actively controlling the temperature.

(vi) Most candidates found it difficult to describe a safety precaution for step 2. Wearing gloves or cutting under teacher supervision, does not make cutting any safer. Cutting the blocks on a flat surface, such as a white tile, or away from the body is a valid safety precaution.

(b) Most candidates were able to clearly identify the correct surface area to volume ratio.

(c) (i) This question assessed candidates' ability to produce a standard biological drawing, following all necessary conventions. Candidates must be able to produce a drawing with clear and continuous lines using a sharp pencil. It is also important that candidates do not shade their drawings.

(ii) This calculation was performed very well by many candidates. The most common error was expressing the final answer to one or two decimal places rather than three as specified in the

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question. Candidates should be reminded to show all working so that partial credit can be awarded even if an error is made in the calculation.

(d) The majority of candidates were awarded full marks for this question. It was clear that candidates were familiar with the biuret test and correctly named biuret reagent as the solution with a change from blue to purple for a positive result.

(e) Many candidates found this question challenging. Some candidates misinterpreted what was being asked of them and could not apply their knowledge to this context. A few candidates discussed enzyme action in detail, without applying it to the question.

Some candidates were able to correctly identify a suitable temperature range in which to complete their investigation. Many were able to identify some variables that should be kept constant, such as the volume of protease enzyme or the length of film. It is important when discussing how to control temperature, that they qualify this by using a thermostatically controlled water-bath. A water-bath alone does not keep the temperature constant.

Question 2

(a) Many candidates were awarded at least one mark for this question. A few candidates listed safety equipment, despite the question excluding these items. The most common correct responses were Bunsen burners and beakers.

(b) (i) Many candidates were able to draw a suitable graph. Some candidates made plotting very challenging by choosing a difficult scale. The most common error was omitting the units when labelling the axes.

(ii) Most candidates used their graph to estimate the concentration of vitamin C. A few did not show on their graph how they had determined their estimate.

(iii) This question proved challenging for some candidates. Many were able to select the correct values, from the table. Fewer were able calculate the percentage decrease accurately. Some candidates confused significant figures with decimal places.

(c) The test for vitamin C was not well-known by candidates. The test reagent for vitamin C is DCPIP. If vitamin C is present, DCPIP turns from blue to colourless.

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BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

Candidates are advised to show all their working when performing calculations. This means that if the final answer is incorrect, credit can be awarded for the correct selection of data or manipulation of the formulae.

Candidates should consider whether the word 'amount' provides the detail they are intending. In many cases, it would be better to refer to the volume or concentration of a substance.

General comments

Most candidates were able to make correct deductions and observations. Many candidates performed very well on the calculations. The data table and graph were well-drawn by most candidates. Some candidates confused the name of the test for protein and the colour of a positive result.

Question 1

(a) (i) Almost all candidates were able to draw a table with an appropriate number of rows and columns and suitable column headings. Most candidates were also able to correctly convert the times into seconds. The most common error was to place units in the body of the table.

(ii) Most candidates were able to provide a conclusion. Some responses did not identify the relationship between the time taken and the dimensions of the block. The responses that could not be credited were those where the data had simply been restated.

(iii) Many candidates were able to identify the time for the block to change colour as the dependent variable for this investigation. This most common incorrect response was hydrochloric acid.

(iv) Many candidates were able to identify the independent variable as the size of the block. This was expressed in a variety of ways with a few using surface area to volume ratio.

(v) Many candidates identified the concentration and volume of hydrochloric acid as variables that were kept constant in the investigation. Some candidates gave amount as an alternative to volume and/or concentration. This generalisation should be avoided.

(vi) A wide variety of ways to improve the investigation were seen. The most common correct suggestion was to collect repeat data.

(vii) Although most candidates suggested safety precautions that would be necessary for step 2 in the procedure, a minority of candidates misread the question and instead described how to achieve precise cutting of the blocks. Of the correct safety precautions, cutting away from the hand or fingers and cutting on a board or tile were the most common. Many candidates gave vague statements about cutting carefully. Others suggested that gloves were required or that cutting should be done under adult supervision. These are not suitable safety precautions.

(b) Almost all candidates were able to calculate the surface area to volume ratio correctly.

(c) (i) Many excellent drawings of the fish gill were seen with detailed observations of the number and position of the lamellae. Many candidates shaded their drawings which meant that maximum credit was not possible. Most candidates made large enough drawings which used the space available effectively. However, it is important to note that drawings should not extend into the printed text.

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(ii) Almost every candidate was able to correctly measure the length of the image of the fish gill and use it to determine the actual length of the gill to three decimal places. The most common incorrect response was 9 mm, instead of 90 mm, due to the confusion between centimetres and millimetres.

(d) Most candidates were able to name the test for protein and describe the result of a positive test. Correct spelling of the test reagent, biuret, is to be encouraged, to avoid confusion with a common piece of laboratory equipment, a burette.

(e) There were many detailed and carefully planned investigations with some candidates gaining maximum marks. Almost all candidates described a suitable range of temperatures. However, very few were able to describe in sufficient detail how these temperatures would be maintained. It is important when describing how to control temperature, that it is qualified by using a thermostatically controlled water-bath. A water-bath alone does not keep the temperature constant. Many candidates were able to identify key variables that should be kept constant and described their experiments being repeated at least three times at each temperature. A few candidates included a prediction of the results, but this is not necessary in a plan.

Question 2

(a) Many candidates were able to name the two pieces of apparatus that would be required to heat a large volume of water and measure the mass of the cabbage leaves.

(b) (i) The majority of candidates were able to choose suitable scales and plot points accurately. Candidates should be encouraged not to choose awkward scales based on multiples of three. While this is not wrong, it often results in the candidates making plotting errors. Sometimes this also impacted their ability to read accurately off the graph in **Question 2(b)(ii)**.

(ii) Most candidates were able to use their graph to estimate the concentration of vitamin C after the cabbage had been boiled for 20 minutes. A few omitted to show on their graph how they had determined their estimate.

(iii) Most candidates were able to calculate the percentage decrease in the vitamin C content in the boiled cabbage. Many candidates were able to round their answers to the correct number of significant figures.

(c) Most candidates correctly described the use of DCPIP to determine the presence of vitamin C.

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