BIOLOGY

Paper 0610/11
Multiple Choice (Core)

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

General comments

Overall the paper proved to be a good test of the candidates' knowledge and ability.

Comments on specific questions

Question 1

Most candidates showed a good understanding of tropic responses.

Question 3

Most candidates were able to use the dichotomous key to correctly identify the species concerned.

Question 5

Many candidates showed a secure knowledge of the structures of the xylem but some were uncertain about the presence or absence of end walls.

Question 15

Although this was a demanding question most candidates were able to correctly apply their knowledge of the function of phloem.

Question 17

Graph interpretation is traditionally a challenging skill to master and this question proved challenging for some. A number of candidates chose the graph that was the reverse of the correct answer.

Question 18

This was a challenging question, but some candidates were able to successfully apply their knowledge of the circulatory system to a novel context.

Question 21

Many candidates recalled the correct concentrations of the constituent gases in expired air. However, some candidates had the misconception that expired air is mainly composed of carbon dioxide.

Question 33

This proved to be the most challenging question on the paper, but it was a standard test of genetics terminology and understanding. Some candidates opted for a cross that would yield a 3:1 ratio, while others may have expected the given ratio to be exactly 1:1 and therefore discounted that option.

Question 38

Some candidates opted for a statement which was scientifically correct but did not answer the question. While it is true that anaerobic respiration in yeast yields alcohol, it is not the reason for its use in bread-making.

BIOLOGY

Paper 0610/12
Multiple Choice (Core)

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

General comments

Overall the paper proved to be a good test of the candidates' knowledge and ability.

Comments on specific questions

Question 6

It is fundamental to a good understanding of plant cell structure and function to know that it is the cell membrane that is partially permeable, while the cell wall is completely permeable, and also to know that the cell wall surrounds the cell membrane. This was known by most candidates but not all.

Question 13

Perhaps because a major function of the colon is to absorb water, some incorrectly thought that it was the only part of the alimentary canal where water absorption occurs.

Question 14

This proved to be challenging for some candidates. Few were able to make the connection between the acidic environment of the stomach and the fact that amylase does not function in an acidic pH. It was also evident that there were misconceptions regarding the position and function of the pancreas, as some thought that digestion occurred in the pancreas.

Question 21

Most candidates correctly identified the chemical barrier to pathogens but some incorrectly thought that white blood cells acted as a chemical barrier.

Question 22

Candidates were very comfortable with the identification of structures associated with the process of breathing, making this one of the most accurately answered questions on the paper.

Question 26

Many candidates thought that the cornea controls rather than refracts light entering the eye.

Question 34

This question required careful reading and a good understanding of genetics which is traditionally an area that many candidates find challenging.

Question 38

Some candidates opted for a statement which was scientifically correct but did not answer the question. While it is true that anaerobic respiration in yeast yields alcohol, it is not the reason for its use in bread-making.

BIOLOGY

Paper 0610/13
Multiple Choice (Core)

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

General comments

Overall the paper proved to be a good test of the candidates' knowledge and ability.

Comments on specific questions

Question 1

The significant point in this question is the reference to *'breathing out'*. A common error is the use of the terms breathing and respiration interchangeably. Only a few candidates realised that breathing out would require muscular movement.

Question 5

The majority of candidates were able to select the correct option showing a clear understanding of calculation specimen size.

Question 16

Some candidates showed a good understanding of how water moves into and through a plant root. Many did not recall that water must pass through the cortex before it reaches the xylem.

Question 17

Some candidates incorrectly believed that water in the xylem at **A** would be moving by osmosis, thus missing the fact that the diagram shows water moving from cell to cell at **D** – a process that can occur only by this method.

Question 22

It was reassuring to note the majority of candidates were familiar with the results of the limewater test for carbon dioxide.

Question 24

Most candidates showed a good understanding and knew that oxygen would be absorbed if the plant was in the dark and therefore not photosynthesising.

Question 25

Most candidates realised that urea would be produced as a result of eating a meal heavy in protein.

Question 30

While most candidates recognised the correct answer, some candidates were unfamiliar with how the contraceptive diaphragm is used.

Question 33

Some candidates found this challenging. It may have been uncertainty over the terms *homozygous* and *heterozygous*. The statement in the question that black hair is dominant may not have been noted by some candidates.

Question 37

When a question includes a negative (‘not’ in this question), it is essential that the candidate thinks very carefully before answering.

BIOLOGY

Paper 0610/21
Multiple Choice (Extended)

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

General comments

Marks were very well spread across the mark range suggesting that all questions fell within the expected capabilities of the candidates taking the paper. A few topics proved challenging for some and they were often topics new to the syllabus.

Comments on specific questions

Question 1

This question provided a welcoming start to the paper with the majority of candidates selecting the correct option.

Question 3

Dichotomous keys were handled competently by nearly all candidates.

Question 5

This question required a quite detailed knowledge of the structure of xylem, which most candidates demonstrated.

Question 9

Many candidates showed a secure knowledge of the limiting factors for photosynthesis and many were able to correctly interpret the graphs.

Question 14

This question was based on one of the new topics (the effects of cholera) in the syllabus and the familiar but challenging topic of water potentials. Some candidates successfully selected the option.

Question 19

There was some confusion over the functioning of the heart valves for some candidates but many were able to select the correct option.

Question 22

There was a misconception among some candidates that an increase in the volume of the thorax produces an increase in pressure in the lungs.

Question 23

Some candidates were able to identify the correct option but many were less sure of how the oxygen debt is removed.

Question 26

That glucagon boosts blood sugar levels was reasonably well known: which organ produces it was less so.

Question 30

Many candidates knew which of the curves on the graph was the correct one for progesterone, but this question proved to be challenging for some.

Question 33

This was a challenging question, for some candidates, on two levels: understanding the terms *hydrophyte* and *xerophyte* and then applying the necessary biological knowledge.

BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

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

General comments

The paper exposed areas that candidates found challenging, notably, the calculation of magnification, the functions of glucagon and insulin, and the organ that produces glucagon.

Comments on specific questions

Question 1

This question demanded more careful thought than might have initially seemed apparent since it had to be appreciated that to produce oxygen, a plant needs to be photosynthesising and that photosynthesis is the plant's method of nutrition.

Question 3

Dichotomous keys were handled competently by nearly all candidates.

Question 4

Cell structure is clearly a topic that is well understood by the majority of candidates.

Question 5

It was clear that many candidates are not comfortable with calculating magnifications. With the knowledge that 1 µm = 1000 mm, and with some careful thought the correct answer should have been within the scope of most candidates.

Question 6

It is fundamental to a good understanding of plant cell structure and function to know that it is the cell membrane that is partially permeable, while the cell wall is completely permeable, and also to know that the cell wall surrounds the cell membrane.

Question 10

It was important appreciated that only respiration was occurring in the test-tube for the correct option which some candidates found challenging.

Question 13

Perhaps because a major function of the colon is to absorb water, there is a misconception that water absorption occurs *only* in that region of the alimentary canal.

Question 17

This question proved challenging to some candidates. A common misconception was that starch is transported around the plant.

Question 19

A common misconception was that the lymphatic system transports blood.

Question 23

Some candidates were able to identify the correct option but many were less sure of how the oxygen debt is removed.

Question 26

That glucagon boosts blood sugar levels was reasonably well known: which organ produces it was less so.

Question 28

The definition of fertilisation was very well known to candidates. .

Question 40

The ecological effects of pollution are becoming well-known and that was evident with the majority of candidates selecting the correct option.

BIOLOGY

Paper 0610/23
Multiple Choice (Extended)

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

General comments

Overall the paper proved to be a good test of the candidates' knowledge and ability.

Comments on specific questions

Question 1

The significant point in this question is the reference to *'breathing out'*. A common error is the use of the terms breathing and respiration interchangeably. Only a few candidates realised that breathing out would require muscular movement.

Question 4

Cell structure is clearly a topic that is well understood by the majority of candidates.

Question 8

Graph interpretation was another arear where candidates showed a good knowledge and understanding.

Question 10

A secure knowledge of leaf structure was exhibited by candidates for this question.

Question 17

This question proved challenging to some candidates. A common misconception was that starch is transported around the plant.

Question 21

The majority of candidates were able to recall this key term definition.

Question 22

Some candidates found this topic challenging. A common error was to class phagocytosis as part of active immunity.

Question 23

Some candidates were able to identify the correct option but many were less sure of how the oxygen debt is removed.

Question 28

The definition of fertilisation was very well known.

Question 30

The hormones associated with the female reproductive system were well understood by many candidates, but some found this topic challenging. Some candidates thought that the curve represented the concentration of LH, but they had failed to realise that LH would normally be expected to peak more sharply and at ovulation rather than clearly before it as shown here.

BIOLOGY

Paper 0610/31
Theory (Core)

Key messages

Candidates should endeavour to read questions carefully and specifically address the question asked; targeting answers so that the information presented is limited to what they know to be directly relevant to the question.

Command words such as “describe”, “explain”, “suggest” and “compare” require different responses from candidates. A “suggest” question encourages the candidate to apply their biological knowledge to the situation presented. If a description is required, including a reference to a graph or table, then it will be expected that data will be used in the description given. Many candidates are able to 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

Candidates appeared to have had sufficient time to complete all sections of the paper.

Comments on specific questions

Section A

Question 1

This question was about classification

(a) All candidates attempted this question and most demonstrated a good understanding. Although a significant number of candidates did not know that Crustaceans have five pairs of legs.

(b) Candidates found this question challenging with many not stating what would be needed to calculate actual size or how to use the information in a calculation.

(c) Most candidates suggested two correct reasons here. The most popular reasons stated were to find food and to avoid predators.

(d) (i) Many candidates recognised that the crustaceans were both *Porcellana* however, some candidates incorrectly stated that the *Porcellana* was the family or group.

(ii) Again, many candidates realised that they were not the same species but some candidates used the wrong term when answering this question.

Question 2

(a) (i) Many candidates could not adequately define the term sense organ.

(ii) Many candidates answered this question well and were able to explain that the reason the eye is described as an organ is that it is made of many/more than one tissue working together.

(b) (i) This question was well answered by some candidates who demonstrated a good knowledge of the structure and functions of the eye, yet it proved challenging for a significant number of candidates.

(ii) The position of the blind spot was not well known by many candidates.

Question 3

(a) (i) This calculation was done well by the majority of the candidates.

(ii) This calculation caused problems for some candidates as they failed to follow instructions to give the answer to one decimal place.

(b) Better candidates recognised that both hot and dry were the conditions that were needed for the most efficient transpiration.

(c) (i) Only a small number of candidates performed well here as many candidates described the function of the tissue, and not the adaptation, as was required by the question

(ii) This question proved challenging for many candidates with only a minority of candidates stating the correct order.

(d) (i) Fewer candidates than expected knew that water is carried in the xylem.

(d)(ii) A significant number of candidates demonstrated their knowledge of the xylem and correctly named another substance.

Question 4

(a) (i) Few candidates could correctly define the term pathogen.

(ii) Pathogens are transmitted in many ways and most candidates knew at least one of them.

(iii) This area of the syllabus was not well known with few candidates able to state examples of mechanical and chemical barriers.

(b) (i) Candidates who performed well here recognised that their answers needed to refer to white blood cells, phagocytosis and the production antibodies. Few candidates gave such comprehensive responses.

(b) (ii) A significant number of candidates demonstrated their knowledge of modern medicine and correctly named a way in which modern medicine can help the body defend itself.

Question 5

(a) (i) and (ii) Many candidates interpreted the graph accurately in this question.

(iii) Many candidates successfully carried out the calculation. Unfortunately, a significant number of candidates forgot to include units with their answer.

(b) Better candidates provided an explanation to support their suggestion.

(c) Human activities causing trout numbers to drop were well known, with many candidates providing at least two correct human activities within their answer.

(d) There were many methods for conserving species that the candidates could have suggested. Most candidates were able to provide at least one correct method.

Question 6

(a) Many candidates successfully followed the instructions here and were able to demonstrate their knowledge of diffusion and active transport.

(b) Many candidates performed well here and were able to correctly name organs for each example of diffusion given. A common error was with candidates who gave animal organs for the plant diffusion examples.

(c) Many candidates correctly stated that plants benefit by a build-up of water because the water provides support.

Question 7

(a) Very few candidates could correctly define the term mechanical digestion.

(b) (i) Many candidates successfully identified the pulp, however **f**ewer candidates could label dentine.

(ii) Explaining why this tooth is not a canine proved a difficult task for candidates.

(iii) Better answers realised the significance of the exposure of the cement when answering this question.

(iv) Most candidates gave good descriptions of ways to maintain healthy teeth.

Question 8

(a) (i) Very few candidates were able to give comprehensive answers to demonstrate that they understood the effect tar has on the body.

(ii) Answers to this question showed that the effects of carbon dioxide on limewater was poorly understood.

(iii) Many candidates showed that they did not know what universal indicator shows.

(iv) Nicotine was a correct answer from many candidates.

(b) Candidates found this question challenging. Iften they could not could not express themselves well enough to adequately explain what the results showed.

(c) Only a small number of candidates performed well and showed an appreciation that that carbon monoxide found in cigarette smoke prevented oxygen being carried.

Question 9

(a) (i) – (iv) There was a spread of marks for these questions with a significant number of candidates demonstrating their knowledge and achieving full marks.

(b) This question was well answered by many candidates.

BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

It is essential that candidates read each question carefully and then answer as required. Frequently marks are lost, not because the candidate writes incorrect Biology, but because what is written does not answer the question.

There were some excellent scripts produced and the overall quality of the papers showed an improvement.

General comments

There are some areas of the syllabus that need specific attention as candidates demonstrated a less complete understanding of these areas. Classification, the use of energy in the body, the cooling effect of sweat and the interpretation of investigative all need a more rigorous approach.

Comments on specific questions

Question 1

Overall, this question was not well answered. Classification is an area of the syllabus that needs reinforcing.

(a)(i) Candidates were shown a diagram of a spider and were asked to identify the arthropod group to which it belonged. A significant number could not identify it as an arachnid. Those who did not know the correct group appeared to be naming other groups from the syllabus randomly.

(ii) Here candidates were asked to give two reasons for their choice in **(a)(i)**. Most knew that having four pairs of legs was an identifying feature, though some mistakenly said that it had either four legs or eight pairs of legs. Many candidates were given credit for selecting four pairs of legs as a feature, even though they had not known the name of the group. Stating a second identifying feature proved more difficult. The division of the body into two main sections was commonly selected. A few candidates used the presence of simple or multiple eyes as a feature; though very few candidates noted the absence of antennae.

(b) Many candidates could name one of the other arthropod groups, but few could name two correctly. Those candidates who answered randomly in **(a)(i)** also answered randomly here.

Question 2

(a)(i) The typical answer contained descriptions of several methods by which pathogens could be transmitted, with no accompanying explanations. These candidates limited the marks that could be awarded to them.

(b)(i) This question asked candidates to outline two body defences against the entry of pathogens. A significant number did not answer the question as they referred to the internal defences of white blood cell activity. Those that answered correctly tended to select the skin and nasal hairs. There was some confusion between hairs and cilia in the upper respiratory tract.

(ii) The majority of candidates could describe two hygienic practices to be followed in food preparation, most commonly citing washing hands with soap, cooking meat at high temperatures and using covers to prevent insects landing on the food. Some candidates limited their answers to hygienic practices in general and not those concerned with food preparation.

(iii) A wide range of answers was acceptable here, and the majority of candidates selected methods that had been developed, such as vaccinations, use of condoms or use of disinfectants. Some weaker candidates read the question with insufficient care and gave answers involving natural body defences.

Question 3

The question was well answered by candidates of all abilities. The most frequent error was linking phagocytosis to root hair cells.

Question 4

(a)(i) The definition of a sustainable resource was not known by most candidates. Many confused it with re-cycling. Very few appreciated the essential nature of sustainability.

(ii) Far more candidates could give examples of sustainable and non-sustainable resources than could give the definition required in **(a)(i)**. On average, more could give an example of a non-sustainable resource than could name a sustainable one.

(b) Few candidates gained were able to write an answer that fully outlined sewage treatment. Most were able to correctly state that separation by filtration occurred followed by the addition of chlorine. There was a lack of awareness of other details from any of the other methods of sewage treatment.

Question 5

(a) The labelling of the respiratory system was carried out fairly accurately by most candidates. The larynx was the structure that was least well known. Some identified the lung as the liver.

(b) Many candidates found this question challenging. Those that selected **P** as having the most efficient gas exchange surface could often not explain why it was the most efficient.

(c)(i) The word equation for respiration was fairly well known by a high proportion of candidates. Weaker answers gave the word equation for photosynthesis or gave an apparently random selection of words drawn from aerobic and anaerobic respiration.

(ii) Most candidates could name at least one use of energy in the body; usually this was for muscle contraction (or a description of movement.) Few candidates were able to outline three distinct uses of energy.

Question 6

(a) Many candidates gained full marks for their description of osmosis. Some candidates described the membrane concerned as being permeable (as opposed to selectively permeable).

(b)(i) Candidates were asked to label a plant cell. Many named the parts accurately. The most common mistakes were to refer to the cell wall as the cell membrane or to call the nucleus a chloroplast.

(ii) Most candidates labelled the vacuole correctly

(c) The majority of candidates gave weak descriptions of the changes in the cell when it was placed in distilled water. This demonstrates that although candidates can describe osmosis, they may not fully understand the process. Of those who described water entering the cell, many did not say that the cell would thus become larger.

Question 7

Many candidates answered this question very accurately.

Question 8

(a) Many candidates could name two ways in which the body lost water (apart from sweating.) A few could only think of one way (usually in excretion) and some others had not read the question with sufficient care and gave sweating as an answer. Breathing out/exhaling was acceptable, but respiration was not, as, although the process of respiration produces water, it is not responsible for the loss of that water from the body.

(b) Candidates were asked to explain how sweating cools the body. Many candidates struggled to provide a full explanation and many weaker answers were not viable explanations. The fact that sweat is produced by sweat glands was the most common correct point given. Extremely few candidates said that evaporation of water required energy and that as this (heat) energy is supplied by the body, the body temperature is lowered.

(c)(i) Many candidates could read the correct figure from the graph, but a substantial number had difficulty interpreting the scale on the y-axis.

(ii) Nearly all candidates could draw the conclusion from the graph that more sweat was produced as the mass of the back-pack increased. Providing a second conclusion proved much more difficult, with most just giving the converse (i.e. the lower the mass in the back-pack, the less sweat was produced.) which was essentially repetition of the same point.

(d)(i) The calculation of the increased sweat produced when a track suit was worn was poorly answered by most candidates. In general, many candidates selected incorrect figures for the calculation.

(ii) It follows that, as many candidates could not explain how sweating cooled the body, they also struggled to explain why wearing a track suit would increase the volume of sweat produced.

Question 9

Candidates were asked to complete sentences about photosynthesis by inserting words from a given list. It appeared that candidates either knew the topic, in which case they performed well, or could recall little about it. In the latter case words appeared to have been selected and inserted at random.

Question 10

(a)(i) Some candidates seemed to have read the question with insufficient care as they said that the specialised cell that absorbed water from the soil was a xylem cell. Many correctly, and specifically, named the root hair cell.

(b) The positions of the xylem in the root and stem were not well known. Slightly more candidates knew its position in the stem than in the root.

(c)(i) Candidates were given details of two investigations on transpiration where grease had been applied to different surfaces of leaves. They were asked to suggest reasons for the results. Both sections of this question proved very difficult for candidates to answer correctly. The answers of the majority contained re-statements of the experimental descriptions which had appeared in the stem of the question. Very few made reference to stomata, or the fact that most stomata are located on the underside of the leaf and very few found on the upper surface.

BIOLOGY

Paper 0610/33
Theory (Core)

Key Messages

Candidates should be aware of the need to read each question carefully and expand their answers sufficiently to obtain all available marks. Working should be shown for calculations.

General Comments

A good understanding of the command words suggest, describe and state was shown. This enabled candidates to fully demonstrate their knowledge and understanding. Some candidates found “define” questions challenging.

Comments on Specific Questions

Question 1

Although candidates were familiar with the features of the animals in Fig. 1.1 and the groups to which they belonged, few were able to state the specific feature shared by all vertebrates.

Question 2

Most candidates correctly identified the vascular tissue and were familiar with its function. However, most described the function rather than explaining how the structure of the xylem enables it to carry out its function.

Question 3

This series of questions was generally well answered, although only a few understood that it is the valves of the heart that make the sound. There was some miscounting of heartbeats, but the actual calculations were usually correct. Candidates should always show their working for calculation type questions. While most candidates understood the risks associated with heart disease, few could describe what happens to the coronary arteries.

Question 4

Candidates showed an excellent understanding of photosynthesis and were able to use the information given in the graph. Responses for the importance of photosynthesis to ecosystems were limited to the idea of everything needing oxygen, rather than to plants as producers. Good responses linked the distance of the lamp to the rate of photosynthesis and many showed that they understood limiting factors.

Question 5

Many candidates demonstrated a good understanding of how particles move around the body. However, few candidates were able to give the two types of digestion as stated in the syllabus. Although understanding of enzymes was very good, candidates should ensure that they have made enough points to gain all the available marks for a question.

Question 6

Careful reading of question **(a)(i)** was needed here. Many candidates described the reflex arc rather than giving the characteristics of a reflex action. However, most were able to show why the action is important and then put the parts of the reflex arc in the correct order.

Question 7

It was important to read the introductory information to this question carefully. Question **7(a)** required a detailed response, some candidates only restated information in the question, which could not be credited. For example, “slow-moving” is given in the question, but “slow-moving so easy to catch” would be accepted. **7(b)** was generally well answered. Some candidates were unfamiliar with the meaning of the word conserved. The question on the loss of a secondary consumer was well answered with responses showing a very good understanding of food webs.

Question 8

Defining genetic terms proved challenging for some candidates. Although the responses for **b(ii)** showed that most candidates understood what the terms *allele* and *recessive* meant. In question **(d)** and **(e),** many candidates were unclear as to the differences between selective breeding and genetic engineering. There were very few correct examples of genetic engineering in a crop plant. The point that herbicide resistance would enable weeds to be killed without harming the crop was missed by some candidates.

Question 9

Although a good understanding of the general processes of nutrition was shown, candidates were unclear about the role of bacteria and sugar in tooth decay. Where acid was mentioned, the source of the acid was not given.

Question 10

Some mathematical errors were seen in the responses to parts **(a)** and **(b)(i)**. It is important for candidates to remember to show their working in these types of question, as marks may be available for the working.

BIOLOGY

Paper 0610/41
Theory (Extended)

Key messages

- Definitions of key terms are given in full in the syllabus. Candidates are expected to know these definitions. Knowledge of key terms also helps candidates to respond appropriately to other questions. There were several questions where this applied: **Questions 3(d)** where candidates were asked to explain how enzymes function, **Question 5(b)(i)** (gravitropism), **Question 6(e)(i)** (genetic engineering) and **Questions 1** and **4** where it was important to be able to distinguish between the terms antibiotics, antigens and antibodies.
- Candidates should always read questions carefully so that irrelevant information is not included in their answers and so that important information is not missed.
- When data is provided in the form of graphs and tables candidates should always be expected to use the data provided in their answers. They can take figures from graphs and tables and use them to support statements that they make. Also they can manipulate them, for example by subtraction and calculating percentages or percentage changes.
- Some candidates provided clear, well planned and thoughtful answers to the longer questions (**Questions 3(d) and Question 5(a)**), but a significant number did not realise that five-mark and six-mark questions require extended responses with different points rather than repetition of the same point. Candidates are encouraged to use continuous prose when writing answers to long-answer questions. Short phrases in bullet points seldom contain sufficient context to gain credit.
- Candidates should always indicate clearly where they have written continuation answers.

General comments

The standard of scripts showed an improvement from last year.

The scripts showed plenty of evidence that many candidates had a good understanding of the syllabus. This was particularly noticeable with regard to the questions on sections new to the syllabus and examined in the November session for the first time. Many answers to **Questions 6(a)(i)**, **6(b)**, **6(c)**, and **6(d)** were sound and well expressed. **Question 3(d)** was the new style long answer question. There were many superb answers showing good depth of knowledge with very many candidates earning full credit.

Some questions proved challenging, in particular, aspects of **Questions 1** and **4**.

Where calculations are required the working leading to the answer should always be shown as in **Question 2(c)**.

Where data is produced from a table (or graph) candidates are required to quote the appropriate units as in **Question 2(b)** and **Question 4(c)**.

Candidates should endeavour to use precise biological terms wherever possible.

Comments on specific questions

Question 1

The answers showed that many candidates were unable to differentiate between the terms *antibiotics*, *antibodies* and *antigens.*

(a) (i) Candidates understood that antibiotics can destroy or kill bacteria which can cause illness. Some candidates stated that ‘antibiotics contain antibodies’, thus showing real confusion between the

two. Candidates need to distinguish between the condition caused by a bacterium and the pathogen itself.

(ii) Although most candidates were aware of the problems of antibiotic resistance they did not always explain this in the right context.

(b) Most candidates were able to name the type of microorganism that produces penicillin.

(c) (i) This proved challenging for some candidates and many thought that hot water alone would sterilise the equipment.

(ii) Almost all candidates completed the first row about the water jacket correctly. It was acceptable to identify **S** as a stirrer or mixer and to give mixes as the function, although stops solids settling and maintains a suspension are better answers. The nutrient inlet (third row) was **Q**. It was not considered sufficient to write 'supply nutrients'. Here some expansion of the answer was required, such as, nutrients for growth or energy, or including the name of a suitable nutrient, such as glucose or ammonia. **R** is a probe or sensor or data logger. The most common error was to name it as some form of meter. Its function is to monitor temperature or pH. The air supply is represented by the letter **U**. 'Providing air for respiration' was an example of a good response.

(d) Many candidates simply wrote that tablets of penicillin were produced, good responses made reference to some aspect of the downstream processing that occurs.

Question 2

(a) The definition of the term *population* was required. The most common error was not making it clear that the group of organisms all belong to one species or to the same species.

(b) Many candidates incorrectly tried to compare the data in the two histograms and did not refer to the variation in body length of the carp. Good responses made reference to the units.

(c) (i) Most candidates added the figures correctly.

(ii) Some good ideas were provided by candidates, including quotas, re-stocking from fish farms, regulations on the mesh sizes of nets, exclusion zones and close seasons when no fishing is permitted.

(d) (i) It was expected that candidates would refer to genetic factors or inheritance and the influence of environmental factors in response to this question about causes of variation in the carp population. Few candidates made any reference to genes or genetic factors.

(ii) A bar graph or bar chart is the appropriate way to present data about discontinuous variation. Many candidates thought a line graph was the correct response.

Question 3

The questions were generally well answered. However, parts **(b)(i)** and **(b)(ii)** proved to be challenging and candidates rarely showed a thorough understanding of experimental techniques.

(a) (i) This was well answered by the majority of candidates.

(ii) Many correct responses were seen. Incorrect responses included the liver and the pancreas.

(b) (i) This tested understanding of the principle of controlling variables. Few candidates made the point that keeping size constant ensures that valid, or meaningful, comparisons can be made between the results in each test-tube. Very few referred to the surface area of the cubes in relation to enzyme activity. Many were able to express the idea that results can be compared, although it would be better to qualify this answer by stating that valid comparisons can be made.

(ii) Many candidates stated that temperature was controlled by a thermometer. However, a thermometer is used to check or monitor the temperature, it does not on its own control the temperature. To do this a water-bath with a thermostat and heater is required. A beaker of water was also accepted as a suitable method although this should be used with a thermometer to

monitor its temperature and hot and/or cold water should be available to maintain the temperature. Keeping test-tubes 'in the same room' does not ensure a constant temperature.

(c) This enzyme is the second protease listed in Section 7.4 of the syllabus. The examiners accepted any value of pH between 7 and 9. Values of pH as low as 2 and as high as 15 were seen.

(d) This topic is clearly well known and some very competent answers were written. A minority of candidates could have improved their responses by using appropriate examples, such as lipase, amylase and maltase. Some candidates did not follow the instruction in the question and used a protease, such as pepsin, as their example. However, many candidates showed a good knowledge and understanding.

Question 4

This question covered a variety of topics from Sections 10 and 7.1. Part **(a)** revealed many misconceptions about the immune system and antibodies in particular. Many candidates gave correct answers to the two parts of **(b)**, but occasionally in the wrong places as they appeared to confuse the cause of vitamin D deficiency with its effects.

(a) (i) Most candidates identified the pancreas as the organ attacked by the immune system. Incorrect responses included the stomach, liver and kidney.

(ii) Some candidates were able to provide good descriptions of antibody function. However, some were unsure of the difference between antibodies and antibiotics. The functions of phagocytes were frequently attributed to antibodies.

(b) (i) The most common correct answer was a lack of sunlight. Some candidates gave an effect of vitamin D deficiency rather than a cause.

(ii) Often those that had given a correct effect in **(b)(i)** wrote an example of a cause in answer to this question. However, many correct answers were seen. 'Weak' or 'weakness' without further qualification was insufficient. Brittle bones are not an effect of vitamin D deficiency.

(c) The best responses compared the two groups of mice on different days. Some good comparative answers were seen. Common errors included using weeks rather than days and omitting the percentage sign.

(d) The most common correct answers were fatigue, glucose in the urine, high blood glucose concentration and thirst. Some candidates concentrated on how the symptoms could be rectified which did not answer the question.

(e) The majority of candidates stated that injecting insulin is a common treatment for Type 1 diabetes in humans. Other correct answers referred to the benefits of exercise, regular meals, and the necessity for regular tests for blood glucose which could be used to determine the dose of insulin required.

Question 5

The question tested candidates' knowledge of root structure and function, plant responses to gravity and the control of plant growth from Sections 2.2, 3.3 and 8.2. The best responses also used information about active transport and mitochondria from Sections 3.3 and 2.1.

(a) Many good responses were seen for this question. A few excellent responses mentioned protein pumps in the root hair cell membranes and the many mitochondria in the cytoplasm of root hair cells that provide the energy for active transport.

(b) (i) The response expected to this question was positive gravitropism or positive geotropism. The examiners accepted gravitropism and geotropism without any qualification, but did not accept the terms if qualified by 'negative'.

(ii) Fewer candidates identified the chemical that controls the gravitropic response.

(iii) Candidates proposed many interesting scenarios for roots growing in any direction other than downwards. It was good to see some naming or describing clinostats. Others described examples of roots coming into contact with a hard object and growing around it. Some candidates were able to reason that a light, shone below an exposed root, would stimulate negative phototropism and the root would grow away from the direction of gravity. Candidates also described growth responses to sources of water that are not below the roots.

Question 6

This question tested topics new to the syllabus from Sections 4, 1.2 and 20.3. Many candidates analysed the base sequences provided in Fig. 6.2 to complete Table 6.1 and Fig. 6.3 correctly.

This is commendable given that the candidates are unlikely to have encountered this type of information before.

(a) (i) Many candidates identified the missing bases correctly.

(ii) Fewer candidates identified the DNA molecule as a double helix. The most common incorrect answer was 'gene'.

(b) Most candidates followed the instructions carefully and completed Table 6.1 correctly with four differences between species **C** and **D**, and three differences between species **G** and **H**.

(c) Many candidates stated that species **A** and **D** are the most distantly related.

(d) Many candidates gave the correct answer.

(e) (i) Many candidates identified the technique successfully, although some confused it with cross breeding and selective breeding.

(ii) It was not essential to name the crop plant although many candidates did. Not all candidates noticed the reference to crop plants in the question and bacteria and even animals were given. The advantages had to match the example chosen and sometimes they were not appropriate or not explained in sufficient detail. Some of the examples chosen are the result of selective breeding and not genetic engineering, for example flower colour and fruit size.

BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

- Definitions of key terms are given in full in the syllabus. Candidates are expected to know these definitions. Knowledge of key terms also helps candidates to respond appropriately to other questions. There were several questions where this applied: **Questions 1(b)** (enzymes), **4(c)(i)** (tissue) and **4(f)** (adaptive feature).
- Candidates should always read questions carefully so that irrelevant information is not included in their answers and so that important information is not missed.
- When data is provided in the form of graphs and tables candidates should always be expected to use the data provided in their answers. They can take figures from graphs and tables and use them to support statements that they make. Also they can manipulate them, for example by subtraction and calculating percentages or percentage changes.
- Some candidates provided clear, well planned and thoughtful answers to the longer questions (**Questions 1(b)** and **Question 6(b)**), but a significant number did not realise that five-mark and six-mark questions require extended responses with different points rather than repetition of the same point.
- Candidates should always indicate clearly where they have written continuation answers.

General comments

Most candidates completed the examination paper which suggests that timing was not an issue. Some candidates found questions on the newer s of the syllabus challenging, in particular **Questions 2(b)**, **2(c)(i)** and **2(c)(ii)**.

Even though candidates were asked to describe the information shown in the graphs in **Questions 1** and **Question 5**, many offered explanations as well or instead of descriptions. Descriptions often lacked suitable qualification. For example, decreases and increases were not qualified by words such as steep or gradual. Good responses included the units for the data quoted.

Question 6(b) allowed candidates to demonstrate their scientific understanding of conservation and the more wide reaching implications of failing to conserve an ecosystem. Many answers dealt with a range of ideas, which was pleasing to see.

There was a common misconception that the function of stomata is to get rid of water in transpiration, rather than allow the diffusion of gases between leaves and the air. Questions which required comparisons were often incomplete. For example, in **Question 1(b)** candidates referred to small molecules rather than to *smaller* molecules. In **Question 5(b)** when describing the conversion of soluble fibrinogen to insoluble fibrin, some candidates only used one part of the comparison, e.g. soluble fibrinogen to fibrin. There was also some confusion between filtration and selective reabsorption in **Question 3(c)** with candidates stating the terms, but then using them in incorrect contexts.

The calculations in **Question 3(e)** and **Question 5(a)** were generally completed well and answers were given to the correct number of significant figures.

Candidates generally showed a good command of English, expressing their ideas in continuous prose where appropriate. When answering extended questions, candidates should be reminded to use the correct scientific terminology and ensure words are spelt correctly.

Comments on specific questions

Question 1

This question ranged across a variety of topics and skills from the syllabus. In part **(b)**, some candidates gave very good answers based on 7.4 (chemical digestion), but they did not include essential information from 5 (enzymes).

(a) Most candidates completed Table 1.1 with appropriate comments on the roles of protein, calcium and lactose found in milk. A common problem was to state that lactose was involved in the *production* of energy or for providing glucose without reference to energy or respiration. Some also confused the use of calcium in milk with that of lactose, stating that lactose was needed for bones.

(b) There were some excellent answers to this question. However, many candidates wasted time by describing mechanical digestion, the role of stomach acid on bacteria, deamination of excess amino acids, and/or the effect of enzymes other than proteases. Good responses used information about the general functions of enzymes from section 5 of the syllabus with information about pepsin and trypsin from section 7.4. Some candidates saw this as a chance to write what they knew about movement of food through the alimentary canal starting with secretion of saliva in the mouth and ending with the absorption of the digested products in the small intestine, unfortunately this did not answer the question. Some candidates wrote about protease, rather than the two specific proteases named in the syllabus.

Common errors and omissions in answers included:

- stating that enzymes digest foods into smaller *particles* or *pieces*
- stating or implying that stomach acid is responsible for the digestion of proteins
- confusing pepsin with peptide
- naming amylase as the enzyme that breaks down proteins in the stomach
- describing the active site and the substrate as having the *same* shape
- confusing the sites of action of pepsin and trypsin
- stating that glucose is the end product of protein digestion
- stating that trypsin is present in pancreatic juice, but not stating that it acts in the small intestine
- not indicating that the pH in the small intestine is alkaline.

(c) (i) Many candidates stated that there is no enzyme to digest it and most of these stated that the name of the missing enzyme is lactase. Others stated that lactose is too large a molecule, but few put both these ideas together. In fact, many candidates stated that lactose is insoluble. Few related the size of the molecule to the movement across the membranes of the epithelial cells that line the villi in the small intestine. Few candidates referred to carrier proteins even though they are included in 3.3 of the syllabus (active transport).

(ii) The dangers to health of long-term diarrhoea were well known to candidates. Some candidates focused too much on describing symptoms, such as stomach pains, rather than the dangers.

(d) (i) Many candidates gave correct responses to this question and only a few were unclear about the difference between a controlled variable and a control experiment.

(ii) Good responses stated that lactase digests lactose converting it into a simple sugar, such as glucose, although many did not attribute the break down to the enzyme. Other answers referred simply to smaller molecules being produced. Candidates rarely said that the products of digestion are small enough to be absorbed. Some said that treatment with lactase makes it possible for people who are lactose intolerant to drink milk or milk products. A common error was to state that lactase was added to ‘sweeten the milk’. Some stated that lactase converts lactose into lactic acid.

(iii) Many candidates correctly answered this question. Many made a comparative data comment

between sample **D** and one or more of the other samples, although they rarely chose the highest concentration of hydrogen gas in **D** which is 15 ppm. Some did not give accurate comparative data quotes, only stating that the hydrogen gas in one sample was more or less than another. Many candidates gave an explanation of the role of bacteria in yoghurt production in their explanation even though this topic is not on the syllabus. Few made reference to the small fluctuations in the concentration of hydrogen gas produced with yoghurt throughout the 5-hour period.

Question 2

(a) Many candidates gave the correct sequence, but surprisingly many did not give the complementary pairing.

(b) Many candidates were not secure in their knowledge of the role of messenger RNA in protein synthesis. Good responses explained that mRNA is a copy of DNA that travels to the cytoplasm where it attaches to a ribosome and that the sequence of bases determines the sequence of amino acids in the protein. Many candidates did not describe the idea of contact between the mRNA and the ribosome adequately. The majority of candidates did not refer to base sequences at all, in spite of the help provided by part **(a)**. Some candidates stated incorrectly that mRNA '*carries* DNA to the cytoplasm'. Very few candidates stated that the DNA remains in the nucleus.

(c) (i) Many candidates interpreted the classification tree in Fig. 4.3 correctly.

(ii) This question was challenging for some candidates. The most common correct responses explained that this species is at the greatest distance from a branching point and that there are no other species on the same branch.

(d) This question was from section 1.2 of the syllabus which refers to morphology and anatomy. Good responses made reference to both and gave examples. Many candidates did not appreciate that the idea of comparison was required. Other studies, such as biochemistry and behaviour, were also accepted. Reference to base sequences, classification and the binomial system did not answer the question.

Question 3

(a) Many candidates answered this correctly, with only few confusing the location the cortex and the medulla and identifying **C** as the urethra rather than as the ureter.

(b) (i) and **(ii)** There were many correct answers to these questions on the blood supply to the kidney. Some candidates gave renal vein for **(i)** and renal artery for **(ii)**. Other blood vessels that were given included the hepatic artery, hepatic vein and hepatic portal vein even though none of these are listed in the syllabus. Surprisingly, many candidates selected structures, such as the ureter, which are not blood vessels.

(c) Many candidates gave good accounts of the role of the kidney in excretion, although many misconceptions were seen. Some candidates did not mention that substances were filtered from the blood. Many candidates stated that salts and water are excreted rather than stating that it is only the *excess* salts and water that are passed out with urea. Others responses implied that urea was the only constituent of urine. Some answers included many unnecessary details, such as the role of the kidney in osmoregulation and glucose homeostasis. Common errors were to state that filtration occurs by diffusion and to confuse the renal capsule for Bowman's capsule. Very few candidates referred to the excretion of hormones. Some answers referred to the excretion of 'worn out cells'.

(d) (i) Definitions of the term *hormone* were sometimes incomplete and did not match the definition given

in the syllabus.

(ii) Surprisingly, not all candidates gave the correct site of production of testosterone.

(iii) Most candidates stated that testosterone has a positive effect on muscle tissue, either by increasing its mass ('building up muscles') or improving its strength. 'Increasing strength' without any mention of muscles was not credited. Fewer candidates went on to refer to testosterone and its effects on promoting protein synthesis and on behavior. A few mentioned increase in bone mass. In view of all the publicity given to drugs in sport, it was surprising that few candidates referred to testosterone as an anabolic steroid. Very commonly, candidates referred to the drug giving more energy to the athlete or improving stamina; some likened its effects to those of adrenaline.

(e) A high proportion of candidates gave the correct response. Common incorrect answers were $25\,ng\,cm^{-3}$ and $0\,ng\,cm^{-3}$. Others divided 25 by 7 to give $3.57\,ng\,cm^{-3}$ which was quite a common error.

Question 4

This question proved the most challenging on the paper. Many responses did not make the connection between the stomatal distribution and gas exchange and some incorrectly referred to transpiration.

(a) Many candidates answered the question correctly.

(b) This question attracted very few correct answers. Few candidates realised that a hydrophyte that is submerged in water, as is the case with *Egeria densa* or *Elodea canadensis*, does not need stomata as the gases can diffuse directly between the cells of the leaves and the surrounding water. Even when realising this, they did not mention that gaseous exchange occurs with 'water'. As water lilies have leaves lying flat on the surface, they are in contact with a source of these gases which penetrate the leaf much faster as there are air-filled spaces. Diffusion in air is very much faster than diffusion in water or through cells. Many examples were seen where candidates mentioned that *Nuphar lutea* leaves are on the water surface, but did not expand the point by referring to diffusion of gases. Some candidates thought that the stomata were for allowing water to enter the plant.

(c) (i) Candidates who answered this question successfully realised that they should use the full definition of the term *tissue* as given in the syllabus. Many candidates stated that a tissue, such as palisade mesophyll, is made up of cells that carry out the same function. They did not indicate (as in section 2.2 of the syllabus) that these cells have the same, or similar, structure.

(ii) Many candidates gave two correct plant tissues that are found in the leaf shown in Fig. 4.2. The most common were spongy mesophyll and epidermis. Xylem and phloem were often given as well. Common incorrect answers included cuticle, stomata, and 'mesophyll' alone.

(d) As with part **(b)**, a few candidates were able to give a suitable response. Candidates often did not state that the air spaces provide buoyancy or help the leaves of the water lily to float. If they did refer to the exchange of gases with the environment, they omitted to state that this occurs with the air. If they referred to photosynthesis or access to light, they did not explain that this would increase as a result of the leaves being located on the water's surface.

(e) Many candidates correctly answered this question.

(f) Some candidates gave a complete definition that matched the syllabus (section 18.2). Very few stated that adaptive features are genetically determined or inherited and that they help organisms to survive *and* reproduce. Only a very small minority stated that these features increase an organism's fitness. Many thought that they are features that help an organism to survive in a *changing environment*. It was also a common misconception for candidates to refer to the adaptive feature as being 'caused by the environment'.

Question 5

(a) Many candidates correctly calculated the missing figure, although some did not give responses to the correct number of decimal places.

(b) There were many good answers to this question on the role of platelets. Most candidates gave good accounts of blood clotting, some with impressive detail beyond the demands of the syllabus. All the points on the mark scheme were seen. Common errors were to confuse fibrin with fibrinogen and also to confuse the solubility of these two proteins. Others did not adequately refer to the nature of the structure formed by fibrin, describing it simply as 'fibres'.

(c) Many candidates stated the function of lymphocytes as the production of antibodies, although some confused them with phagocytes stating that lymphocytes 'engulf pathogens'. Several candidates referred to lymphocytes producing *antibiotics*.

(d) Candidates who knew about the immune response from section 10 gave good responses that included reference to the production of memory cells during a first infection and their use in any subsequent infection by the same pathogen. A few candidates included the term *active immunity* in their answers. Common errors included reference to antibodies remaining in the circulation or in the body rather than referring to memory lymphocytes or memory cells. Others referred to the antibodies creating or turning into memory cells. Many did not explain clearly that the memory cells originated from the primary infection, referring to the 'first time' or 'from before', which was often inadequate.

(e) (i) Many responses gave figures taken from the graph, but often did not include the unit from the vertical axis. It was also evident that some candidates had misread the axis scale. Some failed to qualify the decrease towards the end as being gradual and others omitted the time duration as 10 years. Units were often forgotten, or given simply as 'cells'. Others attempted to explain, rather than describe, the data which did not answer the question.

(ii) Candidates were better at describing the effect on the body of an untreated HIV infection, although few stated that AIDS would develop. Many stated that people would be at increased risk of infectious diseases because of their weakened immune system. Some gave examples of opportunistic infectious diseases, such as TB. Some made the mistake of stating that there were no antibodies produced as there were no lymphocytes present even though Fig. 5.1 showed that this is not the case.

Question 6

(a) This proved challenging for some candidates. Many appeared not to be aware of the need to monitor endangered species. Candidates most commonly stated that the rings were used to follow the movement of birds, followed by checking on population numbers. A number of candidates used the term 'track' without clarification of what was being tracked. Many stated that the rings allow individual birds to be identified even though this information is given in the stem of the question. They also stated that rings prevent birds being hunted, which is far from the case. Other incorrect examples included ringing preventing the birds from 'sinking in the mud' and ensuring that they do not migrate.

(b) Answers to this question on the conservation of wetlands were generally better. The best responses covered a range of topics. They referred to extinction, biodiversity, the provision of food and breeding places. Some mentioned reproduction, but did not relate it to the mudflats as a breeding ground. Many did not use the term extinction, instead referring to 'death of the species'. Some thought more widely and referred to the advantages of conserving ecosystems in general. Some candidates included the ethical and aesthetic reasons for preserving wetlands and other ecosystems for future generations. The use of correct scientific terminology rather than colloquial terms was important. Fewer references were made to the contributions of wetlands towards the nitrogen and water cycles, but several included the need to conserve the wetlands to benefit future generations. A few candidates wrote about pollution and eutrophication which did not answer the question.

BIOLOGY

Paper 0610/43
Theory (Extended)

Key messages

- Definitions of key terms are given in full in the syllabus. Candidates are expected to know these definitions. Knowledge of key terms also helps candidates to respond appropriately to other questions. There were several questions where this applied: **Question 6(b)** where candidates were asked to explain why a leaf is an organ and also in **Question 4(a)** (drugs) and **Question 5(a)(ii)** (genes).
- Candidates should always read questions carefully so that irrelevant information is not included in their answers and so that important information is not missed.
- When data is provided in the form of graphs and tables candidates should always be expected to use the data provided in their answers. They can take figures from graphs and tables and use them to support statements that they make. Also they can manipulate them, for example by subtraction and calculating percentages or percentage changes.
- Some candidates provided clear, well planned and thoughtful answers to the longer question (**Questions 2(a)**), but a significant number did not realise that a six-mark question requires an extended response with different points rather than repetition of the same point.
- Candidates should always indicate clearly where they have written continuation answers.

General comments

A full range of responses and full coverage of the mark scheme were seen. Good use of data with appropriate units was seen in those questions where this was required as in **Questions 3(a)** and **(c)(ii)**, **Question 4(c)(i)** and **(ii)**. However, there was a lack of precision in the recall of the appropriate terminology where definitions or theoretical concepts were assessed; for example, **Question 2(a)**, **Question 3(d)**, **Question 5(a)(i) and (ii)**, **Question 5(b)** and **Question 6(b)**.

Comments on specific questions

Question 1

(a) (i) Almost all candidates labelled the structures shown in Fig. 1.1 correctly. Where mistakes were made candidates often confused the cervix with the vagina.

(ii) Many, but not all, candidates knew that the syringe would be used to extract egg cells. This was an encouraging result given that IVF is a topic with more emphasis in the 2016 syllabus than previously. The most common errors were that the syringe would be used to implant the zygote or to administer hormones.

(b) (i) Most candidates knew that either follicle stimulating hormone (FSH) or luteinising hormone (LH) would be injected to stimulate egg development. However, many candidates confused the hormones used for IVF treatment with those used as contraceptives.

(ii) Fewer candidates were able to state when fertility hormones should be administered during the menstrual cycle. A common mistake was citing ovulation as the correct period of time. Others gave imprecise responses, such as ‘after menstruation’. ‘Immediately after menstruation’ was an acceptable answer.

(iii) Almost all candidates gave a correct response.

(c) A wide range of valid social implications of IVF were discussed in this question. However, genetic screening and the use of embryos for stem cell research were rarely mentioned.

Question 2

(a) In this long-answer question, candidates were required to discuss the function of enzymes, using pectinase as an example. This is the first year that 6-mark questions have been included in the paper. It was pleasing to see that most candidates were able to compose an articulate response that included many of the key points. The full range of marking points were seen, but only some responses gave specific details about pectinase. A small minority of candidates wrote a list of key words or phrases (e.g. 'active site', 'cell walls') which did not provide sufficient context for the marking point in question.

(b) The majority of candidates gave a correct description. A common mistake was to state that eye level should be perpendicular to the meniscus rather than parallel to it. Fewer candidates included the fact that the measuring cylinder should be placed on a flat or level surface. Measuring *below* the meniscus was also a common error. A few candidates wrote a method for obtaining the juice which did not answer the question.

(c) (i) Almost all candidates calculated the rate of the enzyme reaction, but many did not give their answer correct to the nearest whole number.

(ii) Most candidates predicted that experiment **A** with cubes of apple cut to 0.5 cm^3 would give the fastest rate of reaction. Most of these candidates usually went on to explain that this was due to the fact that these cubes have the largest surface area compared to volume. A number of candidates identified a smaller surface area as being responsible for the fastest reaction.

Question 3

(a) Most candidates gave correct comparisons. The fact that the lengths of the small intestine of the rat and the cat were very similar was only spotted by a few candidates. A common error was to refer to the assumed size of the animal rather than the data given in Table 3.1.

(b) Only the best responses showed that glucose moves from the small intestine into the blood by active transport even though this statement has been on the syllabus for many years (see Section 3.3). Candidates should know that glucose molecules are too large to be absorbed by simple diffusion, but this was a common error. Even though candidates who described diffusion were not penalised, they seldom gave insufficient detail about the pathway of glucose molecules from the lumen of the intestine to the blood. Facilitated diffusion is beyond the scope of IGCSE and so candidates are not expected to know this. Some responses were imprecise or restated the question.

(c) (i) Almost all candidates used the data in the table to state that the insect-eating bat had the most villi per centimetre of small intestine.

(ii) Most candidates realised that effective absorption in the duodenum was due to the larger surface area in this section of the small intestine. Good use was made of the ratios given in Table 3.2 and the higher ratios in the duodenum were often linked to increased numbers of villi, but less frequently to the presence of a high density of microvilli.

(d) Many candidates outlined the roles of bile confidently. The most frequent misconception appeared to be that bile either contains digestive enzymes or is itself responsible for the digestion of fats to fatty acids and glycerol.

Question 4

(a) Many candidates applied their knowledge of the definition given in Section 15.1 of the syllabus to explain why nicotine is classified as a drug. The fact that nicotine is addictive was included in almost every answer. However, only the best responses gave sufficient. A common misconception was that nicotine causes lung cancer.

(b) Most candidates identified the components of tobacco smoke, but a considerable number did not state how carbon monoxide and tar affect the gas exchange system. Many descriptions were imprecise or gave the same response for both components.

(c) (i) Many candidates correctly answered the question. The most common answers included discussion of the constant decrease seen in men and the increase followed by a decrease in women. The more general trends in the data, such as the rate of smoking being higher in men throughout the time period, were sometimes overlooked.

(ii) Fewer candidates used both graphs to give a full discussion of the link between smoking and lung cancer. The two mark points that were awarded most frequently were those describing the link between the percentage of men smoking and the subsequent effect on deaths from lung cancer and the same point made for women. Only a few candidates noticed that there was a lag between the changes in percentage of smokers and subsequent deaths from lung cancer. Data quotes were frequently not awarded because of a lack of units. Other lifestyle factors or relevant explanations for the trends were rarely seen. It is possible that candidates are less familiar with 'discuss' as a command word and did not realise that they could include information that was not immediately obvious from the data.

(d) Some good responses included references to the components of tobacco smoke crossing the placenta, but unfortunately some also stated that tar is one of those components. Candidates are expected to know about the biological significance of the components of tobacco smoke (section 15.3 of the syllabus).

Question 5

This question exposed several misconceptions. Some candidates wrote good descriptions of the structure of DNA in **(a)(i)** and were confident in about the use of base sequences in classification and identification in **(d)** and **(e)**. Many only gave very simple descriptions of the functions of mitochondria in **(b)**. Various aspects of DNA are now included in the syllabus and specifically, the functions of some cell components (see Sections 2.1 for mitochondria and 17.5 for ribosomes).

(a) (i) The majority of candidates were familiar with the detailed structure of a DNA molecule. Some candidates discussed amino acids and/or proteins rather than bases. A small number of candidates showed a knowledge of DNA that was far beyond the requirements of the syllabus, this is not expected.

(ii) Although it was evident that almost all candidates knew something about genes, fewer knew that their function is to code for proteins (section 17.2).

(b) Most candidates knew that mitochondria are involved with energy with many describing them as the 'powerhouse of the cell'. However, it was reassuring that many used the appropriate scientific terminology and stated that they were involved in the release of energy. Fewer stated that mitochondria are the site of aerobic respiration. Unfortunately, a considerable number of candidates stated that energy is *produced* or *created* - phraseology that is never credited. Others described release of energy *for* respiration rather than *by* respiration.

(c) A wide range of common features of prokaryotes were stated. The most common answers included the lack of a nucleus and having a cell wall not made of cellulose.

(d) Most candidates correctly answered the question.

(e) A wide range of suggestions were given as to why using DNA sequences is a useful method of identifying species. The most common error was to restate the information in the previous questions about how to compare different species using their DNA sequences. Answers often stated that they could be used to identify a common ancestor by determining the closeness of the sequences. Candidates should have focused on how to determine if bacteria were from the same species using the fact that all individuals will have very similar base sequences. Only a very few candidates recognised that bacteria are hard to classify by appearance alone and therefore it is more accurate and easier to use DNA sequences to classify them.

Question 6

(a) Most candidates gave the correct response. The most common error was to give distinguishing features from other parts of the plant.

(b) Most candidates gave at least part of the reason that leaves are considered organs, but only the best responses provided a full description, including both that they are made of tissues and that the tissues work together to perform a specific function.

(c) Many candidates gave the balanced chemical equation for photosynthesis.

(d) (i) Most candidates correctly identified tissue **J** and a correct adaptation.

(ii) Many candidates identified the next layer, **K**, as the upper epidermis, but fewer gave an adaptation for photosynthesis. Many candidates merely stated that there was the lack of chloroplasts in the epidermis rather than extending their thinking to aspects of the tissue that are specifically adapted for photosynthesis in the leaf.

(iii) Slightly fewer candidates identified **L** as the spongy mesophyll but few could give a correct adaptation.

(e) Most candidates were able to explain why nitrate ions are needed for plant growth. Where mistakes were made candidates often described nitrate ions as if they were proteins, rather than being a key component in the synthesis of amino acids. Only a few mentioned that nitrate ions were used in the synthesis of amino acids, which were then used for protein synthesis.

BIOLOGY

Paper 0610/51
Practical Test

Key Messages

The Practical Test requires candidates to have good experience of using a wide range of practical equipment to gather data that is valid and reliable, or to design an experiment that produces suitable data. This data should be presented in a table using the appropriate SI units. Candidates are required to present data in an appropriate graphical form with a suitable line to represent the trend. The Practical Test requires candidates to draw an accurate representation of a biological specimen.

General Comments

In order to be successful on the Practical Test, candidates should be able to do the following:

Use a wide range of practical equipment to gather data that is valid and reliable, or to design an experiment that produces suitable data. Candidates should be able to justify their choice of equipment and evaluate its accuracy.

Design an experiment that takes into consideration the control variables, how the data is going to be collected and how the data will be analysed.

Data should be presented in a table using the appropriate SI units. Tables must be bordered with appropriate headings. Appropriate SI units or suitable abbreviations should be used. Units should not be used in the body of the table.

Present data in a suitable graphical form with a suitable line to represent the trend. Axes must be labelled, including appropriate units.

Draw an accurate representation of a biological specimen. Lines must be clear and continuous, using a sharp pencil. Label lines should be drawn using a ruler and touching the appropriate structure.

Comments on Specific Questions

Question 1

(a) It pleasing to see that most candidates were able to gain full marks for drawing a table. In some cases, candidates failed to provide suitable heading titles or units for the data collected. It is important that candidates do not include units in the body of the table.

(b) (i) For many candidates this question proved challenging. Candidates were required to calculate the rate of heat loss. Many simply calculated the difference in heat loss between the beakers and therefore were only able to gain one marking point. Another common error was not using suitable units, which the question asked for.

(ii) Many candidates failed to state a suitable relationship between the volume of the body and the rate of heat loss. The ideas of ‘rate’ and ‘total loss’ were often confused by candidates and not used in an appropriate context. A few candidates quoted data from their experiment to support their relationship, allowing them to gain full marks.

(c) (i) This question was answered well by candidates although, in some instances the variables that they suggested were unqualified and not worthy of credit. It is important that candidates understand the difference between a control variable and the independent or dependent variable in their experiment. Many simply listed these, rather than providing a suitable control variable. The most common creditworthy responses were for the time (interval or total time) and the starting temperature of the water.

(ii) In general, this question was poorly answered. Many candidates gave vague responses referring to 'accuracy' with no further qualification. Answers that made a clear reference to the idea that it would take more time for the thermometer to reach the water temperature gained credit.

(iii) This question was focussing on a possible source of error in Steps 2 and 9 in the experiment. Some candidates gave general sources of error that did not relate to these steps. Many candidates discussed errors in measuring rather than the line itself, but went on to provide a suitable explanation relating to volume, and so were allowed this marking point.

(d) The quality of responses to this question was varied. Some candidates had a very clear idea of how to plan a valid and reliable investigation that was similar to the investigation that they had carried out. Almost all candidates were able to state that the two beakers should be placed in different temperatures and that the temperature should be measured at set intervals. A few candidates were able to appropriately identify the control variables involved.

(e) (i) Most candidates were able to draw a very suitable graph. The most common error was extrapolating the line beyond the points. Some candidates failed to use equidistant intervals on their scale.

(ii) This was a well-answered question and candidates scored highly. The most common response gaining full marks gave the suitable trend and supported this with a data quote with the appropriate units.

Question 2

(a) This question required candidates to correctly use a key to identify different flowers. This proved challenging for many candidates. The most easily identified were *Geranium* and *Draba*; however, *Fuschia*, *Sorghum* and *Dactylis* were commonly misidentified.

(b) (i) This question assessed candidates' ability to produce a standard biological drawing. Candidates must be able to produce a drawing using a sharp pencil that exhibits clear and continuous lines. It is important that candidates do not use shading or jagged lines. Candidates were required to draw a diagram that was large (> 80mm) and in proportion. Some candidates did not use suitable labels for the anther and filament.

(ii) Many candidates were able to correctly measure the filament and provide suitable units for their answer. Unfortunately, a number failed to draw a line to show where the filament was measured and lost a mark. Most candidates were able to correctly calculate the magnification. A common error was providing units, such as cm or mm for the magnification.

BIOLOGY

Paper 0610/52
Practical Test

Key messages

It is essential that candidates experience as much practical work as possible during their programme of study in order to practice the skills required.

To achieve high marks candidates should:

- read questions carefully before starting to answer and give only the number of responses required for questions that ask for a specific number.
- be able to identify the different types of variables in a practical
- know how to draw tables that display data clearly using suitable column and row headings, and appropriate units
- be able to select suitable features for comparison between biological specimens

General comments

There were many examples of clear well-presented answers, showing thorough preparation and careful thought. There were some excellent examples of tables drawn carefully with a ruler and with units in the table headings. Less well executed tables were drawn with irregular lines without column headings and with units often in the body of the table. There were also some excellent examples of graphs with scales that fitted all of the grid space provided and could be plotted accurately. Less well executed graphs had irregular scales and the bars plotted adjacent instead of with a space between. Graphs should be plotted so that most of the grid area is used so candidates should look carefully at the data so they can choose a scale that fits the available space.

Drawings were mostly of a good standard showing clear outlines in pencil and occupying most of the space provided.

The Supervisor's Report is very important in ensuring that candidates are credited appropriately when materials have to be substituted for those specified in the confidential instructions. Supervisors should trial practical materials as required in the confidential instructions, sometime in advance of the actual examination. This gives time if any difficulties arise to seek advice about alternative materials from Cambridge Assessment, using the contact information on the Confidential Instructions. In cases, where a substitution is made the Supervisor's Report should include as much detail as possible to allow examiners to assess the candidates answers appropriately.

Comments on specific questions

Question 1

The practical skills tested were accurate measurement using SI units, preparation of a table, recording and describing results, drawing conclusions and using information to plan an investigation to measure the dry mass of seedlings over a period of time.

(a) Almost all candidates gave two correct differences, commonly the colour of the leaves or seedling and the height of the seedlings.

(b)(i) Most candidates were able to construct some type of table. Better tables showed a two main columns with a heading 'light' for one and 'dark' for the other and two rows, one headed 'length of coleoptile/mm' and the other 'total length of seedling/mm'. In addition, either the columns or rows were subdivided into three sections. Less well executed tables often omitted units from the headings and put the units in the table or did not separate the three sets of measurements. Some candidates only gave one measurement for the coleoptile and total length in the dark and in the light. These tables did not gain maximum credit unless the Supervisor's Report made it clear that candidates had not been supplied with three seedlings grown in each of the light conditions. The Supervisor's Report was very important for this question as in some cases candidates had clearly reversed their results for the light grown seedlings with those for the dark grown seedlings when recording them in their tables. The expected SI unit for measuring is millimetres, although credit was allowed for measurements in centimetres. So candidates should be encouraged to measure in whole seconds reactions that take less time than five minutes.

The supervisor's results for the lengths of the coleoptiles showed a wide variation in length. As already noted, these results were important in order to establish that candidates' results were of a similar order of magnitude and had been recorded correctly in their table.

(ii) Very few candidates were able to draw two valid conclusions. There was a tendency to repeat the observations recorded in Table 1.1 instead of interpreting these in terms of where the seedlings had been grown. A great many candidates misinterpreted the observation about colour, and stated that without light, the green colour disappeared, rather than the green colour does not appear unless there is light. Similarly, many candidates stated that light inhibits growth in length, rather than lack of light promoting growth in length. Candidates were not expected to name chlorophyll or chloroplasts as the cause of the green colour, or to know the role of auxins either geotropism or phototropism during shoot growth.

(c)(i) Almost all candidates described biuret test correctly. The only major error was to heat after adding biuret solution, suggesting some confusion with Benedict's test.

(ii) Most candidates completed the table correctly. The supervisor's results were used as a standard to assess the candidates' results.

(iii) Most candidates interpreted their results correctly. In cases where the candidates' results did not match those of the supervisor, error carried forward was allowed for correct interpretation of the results obtained.

(d)(i) The majority of candidates were unable to give a workable plan. It appeared that many of the candidates did not understand the data in Table 1.3 as they often used only 1 seed. Better responses did use the information on page 2 and discussed planting seeds which were then grown in the dark and in the light at a constant temperature. These responses also showed an understanding that seeds would need to be watered while they were growing. The best responses also realised that seedlings would need to be removed and dried at 2 day intervals, so enough had to be planted for 10 measurements over a period of 20 days. It was expected that candidates would realise from Table 1.3, that 10 seedlings at a time were dried and weighed. Less well executed responses did not realise that separate plants were needed every two days. A common misconception was that the same plant could be dried and weighed, then replanted and watered, until it was dried and weighed again. Another common misconception was that growing seedlings without water would mean that the dry mass would be obtained as all the water would be lost by transpiration.

(ii) Only better responses showed the understanding that the water content of a seedling could vary so that valid comparisons could not be made.

Question 2

(a)(i) Most candidates gave two correct answers.

(ii) Most candidates were able to identify at least one variable and how it had been controlled, commonly the total time for the exercise and the total time for the rest period. Better answers gave two correct variables. Less well executed responses were imprecise, for example ‘the time’ or ‘the investigator shouting jump’. Some responses did not recognise what the controlled variables were.

(iii) The majority of candidates gave a correct response. The only common error was to state ‘for the breathing rate to decrease’.

(iv) The better responses referred either to ‘fitness’ or ‘how high they jump’ and were able to link this to an effect on the pulse rate. A common incorrect response was ‘the pulse rate’ suggesting confusion between the dependent variable and an uncontrolled variable. Breathing rate was another common incorrect answer.

(b)(i) Many candidates were able to plot a suitable bar chart. There were relatively few examples of careless plotting. The most common error was to draw all the bars immediately next to one another, without any gap. The data could be grouped as male and female data, or by the activity. Where groups were plotted then there needed to be a gap between the groups. Candidates who shade bars should take care not to extend the shading outside the edges of the bar. Some less well executed responses did not label the bars or give a key for the different activities. Some misinterpreted the question and plotted the averages.

(ii) The best responses were able to identify both a similarity and a difference. Similarities in less well executed often misinterpretation the data, for example, ‘females always have a higher pulse rate than males’, or ‘the resting pulse rate of females is higher’, which did not answer the question. Other responses were unrelated to the data, for example ‘males are fitter than female’ and ‘females take longer to recover from exercise’.

(c)(i) Most candidates were able to draw an outline of the transverse section of an artery. Better drawings were drawn with a sharp pencil without any gaps or shading, with clearly separated layers and showing the irregular lining of the artery. Less well executed drawings were drawn using very heavy thick lines without showing the irregular inner lining. The majority of candidates used most of the space provided.

(ii) Almost all candidates measured the diameter of the artery correctly and the majority knew how to calculate the magnification from their measurement. Most candidates measured in millimetres and included the units. Measurements in centimetres were accepted. Error carried forward was allowed for the candidates' measurements that were incorrect. A minority of candidates did not draw a line on their drawing.

BIOLOGY

Paper 0610/53
Practical Test

Key messages

- Candidates must ensure that they read the questions carefully before starting to answer. This is particularly important for any planning exercise that is required. Identification of the dependent and independent variables is vital before a plan is completed.
- Candidates should try to match the answers they give with the number of marks available for each part of a question – for example, a three-mark question most likely requiring three separate marking points.
- Candidates must be familiar with the practical procedures indicated by the syllabus. This means that candidates are expected to be able to carry out these procedures safely, but also that they should be able to work safely and with competence on practical procedures.
- When asked about safety considerations, candidates should identify risks, but also identify suitable methods of reducing those risks.
- Mathematical calculations form an important part of the practical assessment. It is essential that candidates check all of their working carefully and take time to consider whether the resulting answer is realistic.

General comments

The examination paper consisted of two questions testing candidates' skills in a variety of areas. The planning and setting-up of practical work on the breakdown of hydrogen peroxide was required.

Candidates were required to construct a table and record results, consider safety aspects, identify sources of error in the methods used and suggest improvements to the method.

Candidates were also required to construct a plan for an experiment to test an independent variable. This could have been based partly on the experiment already described, but also required candidates to consider other variables.

A drawing was required, together with calculations of percentage change and the production of a simple bar chart.

Generally, candidates did well throughout the paper but certain areas proved more challenging than others. The production of a table in which to record data was well answered, as was the plotting of a graph from the data given. Areas such as the biological drawing and planning activity were less well done however, and candidates may require more practice at these types of questions.

Most candidates answered all of the questions on the paper with very few responses left blank, a great improvement on previous series.

Comments on specific questions

Question 1

This question involved the candidates carrying out an investigation in which the enzyme catalase in potato tissue was used to break down hydrogen peroxide to produce oxygen. Candidates recorded results, calculated the rate of gas production and explained the results produced. Candidates had to evaluate the method used and plan another investigation related to this practical.

(a) Almost all students could construct a suitable table but the most common error was putting the units in the body of the table rather than in the heading. A few recorded the volume of water rather than gas. A few did not draw a box around the heading.

(b)(i) Most students successfully calculated the rate by dividing by 3 (minutes) to get the correct answer. A few multiplied by 3, or divided by 180 or by 6.

(ii) Some students described the effect of changing surface area rather than the effect on surface area, hence writing too much or missing out the required information. It is important that candidates read the questions very carefully before attempting an answer.

(iii) Many candidates failed to use their results from **1(b)(i)** (this was asked for in the question) and so gained just one mark. Students found the explanation difficult to express, so only the more able scored credit here.

(c) A large number of candidates correctly related the size of the measuring cylinder to the accuracy of the results, but a significant number did not record trial data or suggested using an inappropriately sized measuring cylinder.

(d) Many students gave suitable variables, but had not appreciated that the question was asking for those kept constant in this investigation.

(e) A large number of candidates found this question challenging. They had difficulty appreciating that the question was asking for specific sources of error, rather than just general improvements. Many students suggested alternative pieces of apparatus, for example gas syringes, measuring cylinders or burettes. Others described human errors such as parallax errors when reading the scale, rather than faults in the design. Others made changes to the whole aim of the experiment such as to try many different sized pieces of potato.

(f) There was confusion between a control and a controlled variable, with many students giving the latter rather than what was asked for.

(g) This question was well answered, with most candidates able to gain some marks. Marks were lost for failing to give details of controlled variables such as temperature, safety issues and comparisons between the plants. A few candidates completely missed the focus of the question, writing about the starch test for a leaf, Benedict's test or the biuret test.

(h) Most candidates plotted the data correctly but many drew a line graph rather than a bar chart. Not all of the students left a gap between the bars and a few drew bars of unequal widths.

(i) A very well answered question and many knew the Benedict's test very well. The most common mistake was a failure to apply heat. Only a few gave the wrong food test – the biuret or iodine test.

Question 2

This question required candidates to make a large drawing of three onion cells and compare these cells with cells kept under different osmotic conditions. A calculation of percentage increase in cell length was required.

(a)(i) Most students made a good attempt at the drawing exercise but many were unable to draw a smooth, continuous outline and many missed any detail inside the cells. A few candidates drew only the vacuoles (possibly believing these were cells) or tried to draw a typical plant cell.

(ii) The measurements made by candidates were generally good, although a few gave their answer in centimetres. The percentage increase was often incorrect. Some students used their measurement figures in the wrong equations, leading to incorrect answers.

(b) This was often correctly answered but a few gave differences rather than similarities.

BIOLOGY

Paper 0610/61
Alternative to Practical

Key Message

Candidates should have good experience of practical methodology and reporting as outlined in the syllabus, so that they are suitably prepared for this paper.

General comments

The marks covered the whole range of abilities, with many candidates well prepared for the exam. To do well, candidates must include enough detail in their answers. For example, they should quote from the data given to illustrate their point.

For drawings, it is important that candidates use a sharp HB pencil and eraser. Drawings should consist of clear, continuous lines and have no shading.

When drawing a graph, candidates should label the axes, with units, and use even scales. Candidates need to recognise when it is appropriate to draw a bar graph and when it is better to choose a line graph. In this case a line graph should have been drawn, as there is continuous data.

When drawing a table, candidates must include headings with units at the top of the columns. The units should not be included in the body of the table.

Comments on specific questions

Question 1

(a) It is pleasing to see that most candidates were able to gain full marks for drawing a table. In some cases, candidates failed to provide suitable heading titles or units for the data collected. It is important that candidates do not include units in the body of the table. Two marks were awarded for correctly recording the temperature readings from the drawings of thermometers. This had to be carefully done to the nearest 0.5 ºC (e.g. beaker A at 5 minutes was 70.5 ºC).

(b) (i) For many candidates this question proved challenging. Candidates were required to calculate the rate of heat loss. Many simply calculated the difference in heat loss between the beakers and therefore were only able to gain one marking point. Another common error was not using suitable units, which the question asked for.

(ii) Many candidates failed to state a suitable relationship between the volume of the body and the rate of heat loss. The ideas of 'rate' and 'total loss' were often confused by candidates and not used in an appropriate context. A few candidates quoted data from their experiment to support their relationship, allowing them to gain full marks.

(c) (i) This question was answered well by candidates although, in some instances the variables that they suggested were unqualified and not worthy of credit. It is important that candidates understand the difference between a control variable and the independent or dependent variable in their experiment. Many simply listed these, rather than providing a suitable control variable. The most common creditworthy responses were for the time (interval or total time) and the starting temperature of the water.

(ii) In general, this question was poorly answered. Many candidates gave vague responses referring to 'accuracy' with no further qualification. Answers that made a clear reference to the idea that it would take more time for the thermometer to reach the water temperature gained credit.

(iii) This question was focussing on a possible source of error in Step 2 in the experiment. Some candidates gave general sources of error that did not relate to this step. Many candidates discussed errors in measuring rather than the line itself, but went on to provide a suitable explanation relating to volume, and so were allowed this marking point.

(iv) Candidates had to give one safety precaution associated with carrying out this investigation. Most were familiar with common safety precautions such as wearing goggles and gloves to protect themselves from the hot water. Simply saying ‘be careful with hot water’ or ‘don't touch’ was insufficient for a mark.

(d) The quality of responses to this question was varied. Some candidates had a very clear idea of how to plan a valid and reliable investigation that was similar to the investigation that they had carried out. Almost all candidates were able to state that the two beakers should be placed in different temperatures and that the temperature should be measured at set intervals. A few candidates were able to appropriately identify the control variables involved.

(e) (i) Most candidates were able to draw a very suitable graph. The most common error was extrapolating the line beyond the points. Some candidates failed to use equidistant intervals on their scale.

(ii) This was a well-answered question and candidates scored highly. The most common response gaining full marks gave the suitable trend and supported this with a data quote with the appropriate units.

Question 2

(a) This question required candidates to correctly use a key to identify different flowers. This proved challenging for many candidates. The most easily identified were *Geranium* and *Draba*; however, *Fuschia*, *Sorghum* and *Dactylis* were commonly misidentified.

(b) (i) This question assessed candidates’ ability to produce a standard biological drawing. Candidates must be able to produce a drawing using a sharp pencil that exhibits clear and continuous lines. It is important that candidates do not use shading or jagged lines. Candidates were required to draw a diagram that was large (> 80mm) and in proportion. Some candidates did not use suitable labels for the anther and filament.

(ii) Candidates had to measure the length of the filament on Fig 2.2 and the length of the filament from a line on their drawing, and use these numbers to calculate the magnification of the drawing. It is important that candidates bring a good quality ruler to the exam for questions such as this. Most candidates did well in this question. The main errors were failing to include a measurement line on their drawing, and to include units for magnification.

BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

There were many excellent scripts where the answers were accurate, informed, well-reasoned and clearly presented. Some candidates require more practice in the following areas: constructing a table, planning an investigation, drawing a graph and drawing a diagram.

General comments

Candidates must read a question carefully before starting to write their answer. They must also follow the instructions precisely. It would be helpful for the candidates to look at both the mark allowance for an answer and at the space provided for it. In some cases only one piece of information is provided in an answer when there are two marks available.

When drawing a diagram, a pencil should be used and an eraser should be available. Thus any errors can be rectified easily. Lines need to be continuous, with no breaks and no overlaps. Shading and artistic additions should not appear.

When drawing a graph, candidates should use a sharp pencil. Axes need to be fully labelled with units stated. The scale must be even, but need not necessarily start at zero. The completed graph should occupy more than half of the grid provided. The size of the printed grid is chosen to give candidates an easy scale to use. Candidates need to recognise when it is appropriate to draw a line graph, a bar chart or a histogram. (Line graphs are for continuous data, bar charts for discontinuous data and histograms are used for displaying data frequency.)

The construction of a table should be done with ruled lines, preferably with an outer border. Units need to appear in the headings and not in the cells of the table. Each item of information needs to be in a discrete cell.

Comments on specific questions

Question 1

(a) Most candidates were asked to compare seedlings grown in the light with seedlings grown in the dark and to state two visible differences between them. Some candidates selected differences that were not visible, such as the colour of the plants and their ability to photosynthesise. This did not answer the question.

(b) (i) Most candidates produced good tables. Some were excellent. The main points where some candidates could improve are to include the units in the table headings and to ensure that all the information required is represented.

(ii) Many candidates used the results from their table and addressed both requirements. Some gave unnecessary information about the process of photosynthesis and the role of auxins. The distinction between germination and growth was an area that some found challenging.

(c) (i) Many candidates followed the instructions and gave the actual results (i.e. the colours obtained). Other candidates went further and interpreted these results by drawing conclusions from them (i.e. stating what type of food was absent or present), this was not required.

A few candidates did not quote the results they had been given, but the results that they thought might be obtained, working from their theoretical knowledge.

(ii) Most candidates answered this question correctly. A few gave incomplete responses as they did not comment on presence or absence of reducing sugars.

(d) (i) Some candidates found the planning question challenging and some had perhaps not used the information provided. There was a misconception among some candidates that after taking the dry weight of a seedling, it could be replanted and would continue to grow.

(ii) Good responses explained that the water content of seedlings would vary. Some were unsure of the difference between mass and dry mass.

Question 2

(a) (i) This task was performed accurately by the majority.

(ii) This was well answered by most candidates. Some listed variables that they would like to control, such as age of the students or room temperature, rather than what was actually controlled.

(iii) Most candidates understood that it was important for the pulse rate to return to normal. A few stated that pulse rate had to be lowered, which is not the same.

(iv) This proved to be a challenging question for some. Some of those who cited factors such as the height of the jump or the fitness of the students, did not explain the impact of the variable on the results.

(b) (i) Many candidates drew excellent graphs. The labelling of the axes was usually complete, although not all had units. Most candidates used a scale that was even with the graph filling more than half the grid provided. Some found plotting three averages challenging or plotted only the males or only females. Bars should be of equal width with equal spaces between the bars (or bars placed in sets with equal spaces between the sets).

(ii) The majority of candidates could give a similarity but few could state a difference. It was necessary to look at the increase or decrease in pulse rates between males and females during the specific exercises.

(c) (i) Nearly all candidates drew a diagram that was sufficiently large. Some lines were sketchy, but there was relatively little shading used. It was important to show the convolutions of the endothelium, or the relative thicknesses of the outer layers for the detail marking points.

(ii) This was well answered by most candidates. A few candidates did not draw a line on their diagram, as instructed.

BIOLOGY

Paper 0610/63
Alternative to Practical

Key messages

- Candidates must ensure that they read the questions carefully before starting to answer. This is particularly important for any planning exercise that is required. Identification of the dependent and independent variables is vital before a plan is completed.
- Candidates should also try to match the answers they give with the number of marks available for each part of a question – for example, a three-mark question most likely requiring three separate marking points.
- Candidates must be familiar with the practical procedures indicated by the syllabus. This means that candidates are expected to be able to carry out these procedures safely, but also that they should be able to work safely and with competence on practical procedures.
- When asked about safety considerations, candidates should identify risks, but also identify suitable methods of reducing those risks.
- Mathematical calculations form an important part of the practical assessment. It is essential that candidates check all of their working carefully and take time to consider whether the resulting answer is realistic.

General comments

The examination paper consisted of two questions testing candidates' skills in a variety of areas. The recording of data on the breakdown of hydrogen peroxide in a suitable table was required.

Candidates were required to construct a table and record results, consider safety aspects, identify sources of error in the methods used and suggest improvements to the method.

Candidates were also required to construct a plan for an experiment to test an independent variable. This could have been based partly on the experiment already described, but also required candidates to consider other variables.

A drawing was required, together with calculations of percentage change and the production of a simple bar chart.

Generally candidates did well throughout the paper, but certain areas proved more challenging than others. The production of a table in which to record data was well answered, as was the plotting of a graph from the data given. Areas such as the biological drawing and planning activity were less well done however, and candidates may require more practice at these types of questions.

Most candidates answered all of the questions on the paper with very few responses left blank, a great improvement on previous series.

Comments on specific questions

Question 1

This question involved the candidates carrying out of an investigation in which the enzyme catalase in potato tissue was used to break down hydrogen peroxide to produce oxygen. Candidates recorded results, calculated the rate of gas production and explained the results produced. Candidates had to evaluate the method used and plan another investigation related to the one described.

(a) Almost all students could construct a suitable table but the most common error was putting the units in the body of the table rather than in the heading. A few recorded the volume of water rather than gas. A few did not draw a box around the heading.

(b)(i) Most students successfully calculated rate by dividing by 3 (minutes) to get the correct answer. A few multiplied by 3, or divided by 180 or by 6.

(ii) Some students described the effect of changing surface area rather than the effect on surface area, hence writing too much or missing out the required information. It is important that candidates read the questions very carefully before attempting an answer.

(iii) Many candidates failed to use any of the data from **1(b)(i)** (this was asked for in the question) and so gained just one mark. Students found the explanation difficult to express, so only the more able scored credit here.

(c) A large number of candidates correctly related the size of the measuring cylinder to the accuracy of the results, but a significant number did not record trial data or suggested using an inappropriately sized measuring cylinder.

(d) Many students gave suitable variables, but had not appreciated that the question was asking for those kept constant in this investigation.

(e) A large number of candidates found this question challenging. They had difficulty appreciating that the question was asking for sources of error, rather than just general improvements. Many students suggested alternative pieces of apparatus for example gas syringes, measuring cylinders or burettes. Others described human errors such as parallax errors when reading the scale, rather than faults in the design. Others made changes to the whole aim of the experiment such as to try many different sized pieces of potato.

(f) There was confusion between a control and a controlled variable with many students giving the latter rather than what was asked for.

(g) This question was well answered, with most candidates able to gain some marks. Marks were lost for failing to give details of controlled variables such as temperature, safety issues and comparisons between the plants. Only a few candidates completely missed the focus of the question, writing about the starch test for a leaf, Benedict's test or the biuret test.

(h) Most candidates plotted the data correctly but many drew a line graph rather than a bar chart. Not all of the students left a gap between the bars and a few drew bars of unequal widths.

(i) A very well answered question and many knew the Benedict's test very well. The most common mistake was a failure to apply heat. Only a few gave the wrong food test – the biuret or iodine test.

Question 2

This question required candidates to make a large drawing of three onion cells and compare these cells with cells kept under different osmotic conditions. A calculation of percentage increase in cell length was required.

(a)(i) Most students made a good attempt at the drawing exercise but many were unable to draw a smooth, continuous outline and many missed any detail inside the cells. A few candidates drew only the vacuoles (possibly believing these were cells) or tried to draw a typical plant cell.

(ii) The measurements made by candidates were generally good, although a few gave their answer in centimetres. The percentage increase was often incorrect. Some students used their measurement figures in the wrong equations, leading to incorrect answers.

(b) This was often correctly answered but a few gave differences rather than similarities.