BIOLOGY

Paper 0610/11
Multiple Choice (Core)

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

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. The sources of vitamin C and birth control were topics that candidates knew well. Interpreting graphs proved to be more challenging.

Comments on specific questions

Question 3

While many understood that amphibians have moist skin without scales, some believed that amphibian skin possesses scales.

Question 5

Most candidates correctly identified the chloroplast as the site where sugar is made, although some believed that sugar is made in the vacuole.

Questions 6

Most candidates understood that root hairs increase the surface area of root cells. Some wrongly believed that root hairs are used for the maintenance of the temperature of the cell sap.

Question 8

While many candidates correctly identified that it is the cell surface membrane that is partially permeable, some incorrectly opted for the cell wall.

Question 10

Many candidates understood how the axes should be labelled; some were uncertain as to which axis represents the 'pH' and which represents the 'rate of reaction.'

Question 11

This was a well-answered question.

Questions 12 and 31

These were well-answered by the majority.

Question 13

While many candidates correctly identified that a young, active woman requires more iron than a young, active man, some believed that the woman requires more protein.

Question 15

Some candidates were able to correctly identify tissue **C** (the xylem) as transporting water.

Question 18

Although many candidates correctly identified blood component '**D**' (platelets) as being responsible for clotting, many opted for an incorrect blood component.

Question 19

Most candidates correctly identified a transmissible disease as a disease caused when a pathogen passes from one host to another. Some wrongly believed that a transmissible disease is caused when a pathogen passes to the host's body only by direct contact.

Question 20

While many candidates were able to identify the correct response, others were unable to use their knowledge to problem solve and derive the answer.

Question 21

Few were able to select the correct option. Some were not aware that only a little energy is released from anaerobic respiration.

Question 23

Many candidates correctly opted for muscles and glands as effectors. A common incorrect response was the brain and spinal cord.

Question 25

While many candidates appreciated that shivering involves the action of muscles, some wrongly believed that sweating requires the action of muscles.

Question 26

Most candidates responded correctly to this question, a few believed that antibiotics are effective against scurvy.

Question 27

This proved to be a challenging question with few able to derive the correct answer.

Question 29

Many candidates opted for the correct answer, although some incorrectly believed that menstruation is the release of an egg.

Question 33

While some candidates opted for the correct answer, the majority did not seem to appreciate that meiosis produces gametes (sperm cells).

Question 34

Only some candidates appreciated that ionising radiation increases the rate of mutation.

Question 36

While many candidates identified the correct option, some believed that the hazel trees, and even the soil, are the principal sources of energy for the food chain.

Question 37

The majority of candidates opted for a wrong answer, suggesting that this topic is not well understood.

Question 39

While many candidates opted for the correct answer, some incorrectly opted for selective breeding as an example of genetic engineering.

BIOLOGY

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Paper 0610/12
Multiple Choice (Core)
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Question Number	Key	Question Number	Key
1	A	21	A
2	B	22	C
3	C	23	D
4	D	24	D
5	B	25	A
6	B	26	C
7	B	27	B
8	B	28	D
9	C	29	D
10	A	30	A
11	B	31	D
12	A	32	D
13	C	33	B
14	D	34	B
15	D	35	A
16	B	36	D
17	B	37	C
18	D	38	B
19	C	39	B
20	D	40	A

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. The questions on mucus as a defence against disease; the effects of adrenaline, and the definition of a drug were well answered.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, many also believed that only animals carry out these characteristics.

Question 3

While many candidates understood that amphibians have moist skin without scales, some believed that amphibian skin possesses scales.

Question 5

While most candidates correctly identified the chloroplast as the site where sugar is made, some believed that sugar is made in the vacuole.

Question 6

Most candidates understood that root hairs increase the surface area of root cells. Some wrongly believed that root hairs are used for the maintenance of the temperature of the cell sap.

Question 7

This proved to be a challenging question with similar numbers of candidates choosing most options suggesting that diffusion gradients are not well understood or that some are unfamiliar with the products of respiration.

Question 8

While many candidates correctly identified that it is the cell surface membrane that is partially permeable, some incorrectly opted for the cell wall.

Question 10

Many candidates understood how the axes should be labelled; some, though, were uncertain which axis represents the 'pH' and which represents the 'rate of reaction.'

Question 11

Although many candidates appreciated that photosynthesis is using up the carbon dioxide and changing the indicator colour, some candidates mistakenly opted for respiration.

Question 12

While some candidates identified that nitrate ions are needed to make amino acids, many wrongly believed that nitrate ions are needed to make fatty acids, glucose or starch.

Question 13

Most appreciated that both chemical and mechanical digestion occurs in the mouth.

Question 14

This proved to be a challenging question, with most candidates incorrectly opting for the colon as the site where most water is absorbed. Responses indicate uncertainty in this topic.

Question 16

This proved to be a challenging question with only some candidates opting for the correct answer. It was not appreciated by many that in this type of investigation, all factors should be kept constant except the one that is being investigated.

Question 18

While many candidates correctly identified blood component 'D' (platelets) as being responsible for clotting, many opted for an incorrect blood component.

Questions 19, 24, 26 and 27

These were well-answered by most candidates.

Question 20

Many candidates were able to identify the correct answer, although some found this challenging.

Question 21

Few were able to select the correct option. Some were not aware that only a little energy is released from anaerobic respiration.

Question 22

Most candidates chose the correct option, although there was some confusion between the terms ureter and urethra.

Question 23

While many candidates identified the correct answer (the 'synapse'), some were less confident with this topic.

Question 25

This proved to be a challenging question with many incorrectly believing that the shoot showed a phototropic response. The seedling was growing inside a dark box, preventing responses to light.

Question 28

The spread of responses suggests some uncertainty about the topic of asexual reproduction and genotypes.

Question 30

Candidates found the interpretation of graphical information about the menstrual cycle challenging.

Question 31

While many candidates correctly identified the birth control device as an IUD, a similar number believed it to be a diaphragm or femidom.

Question 32

There was some uncertainty about which sex chromosomes are found inside sperm cells.

Question 34

While many candidates understood what an adaptive feature of an organism is, some incorrectly believed that it is any feature that is changed by the environment.

Question 37

Only some candidates opted for the correct answer suggesting uncertainty about the processes involved in the carbon cycle.

Question 38

While many candidates realised that in genetic engineering, genes for insulin are inserted into a bacterial cell, a similar number wrongly opted for animal or human cells.

BIOLOGY

Paper 0610/13
Multiple Choice (Core)

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

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. A number of misconceptions and areas of knowledge that are less well understood are detailed against individual questions. The questions on the structure of the leaf; the use of calcium in a pregnant woman; the names of parts of the alimentary canal; identifying the bladder; the role of insulin; the role of the liver; parts of the human reproductive system, and the water cycle were well understood.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, many also incorrectly believed that only animals carry out these characteristics.

Question 3

While many candidates understood that amphibians have moist skin without scales, some believed that amphibian skin possesses scales.

Question 4

Most candidates were able to use the key to derive the correct answer, although some identified the plant wrongly by not observing carefully the appearance of the leaves.

Question 5

While most candidates correctly identified the chloroplast as the site where sugar is made, some incorrectly believed that sugar is made in the vacuole.

Question 6

Most candidates understood that root hairs increase the surface area of root cells. Some wrongly believed that root hairs are used for the maintenance of the temperature of the cell sap.

Question 8

While some candidates correctly identified that it is the surface membrane that is partially permeable, many incorrectly opted for the cell wall.

Question 9

Although some candidates correctly identified that the fruit contained protein and reducing sugar, many showed a less secure knowledge of food test results.

Question 10

Many candidates understood how the axes should be labelled; some, though, were uncertain which axis represents the 'pH' and which represents the 'rate of reaction.'

Question 13, 14, 24 and 37

These were well-answered by most candidates.

Question 16

Many candidates correctly opted for the rate of respiration not affecting the rate of transpiration, although some incorrectly believed that the number of open stomata does not affect transpiration.

Question 18

While some candidates correctly identified blood component '**D**' (platelets) as being responsible for blood clotting, the majority of candidates opted for an incorrect blood component.

Question 21

The question proved to be challenging with few showing a good understanding of anaerobic respiration.

Question 23

This question was well-answered by many candidates, although some wrongly believed that the sequence of the reflex action commenced with a receptor, which generates the stimulus.

Question 25

This proved to be a challenging question with only some candidates opting for the correct answer.

Question 28 and 29

Only some candidates understood the features of asexual and sexual reproduction.

Question 31

The fact that oestrogen is responsible for the development of secondary sexual characteristics was not well known.

Question 32

There is some confusion about the name of the length of DNA that codes for a protein. The commonest incorrect responses were gene and amino acid.

Question 34

This was a challenging question with many choosing one of the first three options.

Question 39

While many candidates correctly identified methane as a source of air pollution, some opted for herbicides.

BIOLOGY

> **Paper 0610/21**
> **Multiple Choice (Extended)**

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

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. Good knowledge of many areas of the syllabus was demonstrated by the majority of candidates.

Comments on specific questions

Question 1

Many candidates appreciated that all plants and animals carry out the characteristics of living things. Some believed that only animals carry out these characteristics.

Question 3

Although this question was well answered by the majority of candidates, some believed that amphibian skin possesses scales.

Questions 6, 7, 8, 9, 10, 11, 12, 14, 16, 23, 24, 25, 26, 27, 28, 29, 30, 36 and 39

These questions were well-answered by the majority of candidates.

Question 13

While many candidates correctly identified that a young, active woman requires more iron than a young, active man, some believed that the woman requires more protein.

Question 18

This question was well understood by many candidates, although some were uncertain whether fibrin is converted to fibrinogen (incorrect) or fibrinogen to fibrin (correct).

Question 19

Many candidates chose the correct option. Incorrect responses suggested that the term 'passive' was not understood by all.

Question 20

While most candidates understood what muscle action is required for inspiration, some were uncertain as to which way round the external and internal intercostal muscles work.

Question 21

While many candidates gave the correct response, many were uncertain of the differences between aerobic and anaerobic respiration in yeast.

Question 22

This was well-answered. One common misconception was that glucose would not be found in the fluid entering the kidney tubule.

Question 33

Many candidates opted for the correct answer. The commonest wrong response was option A. While it is true that heterozygous individuals do suffer from symptoms, the question asked for benefits of being heterozygous so this ruled out option A as it is not beneficial to be symptomatic.

Question 38

Only some candidates chose the correct option. Many candidates appeared uncertain as to what is required to grow *Penicillium* in a fermenter.

BIOLOGY

> **Paper 0610/22**
> **Multiple Choice (Extended)**

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

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. Good knowledge of many areas of the syllabus was demonstrated by the majority of candidates.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, some also believed that only animals carry out these characteristics.

Questions 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 16, 21, 23, 31, 32, 34, 36, 39 and 40

These questions were well-answered by the majority of candidates.

Question 14

There was some uncertainty as to whether most water is absorbed in the small intestine (correct option) or in the colon (incorrect option).

Question 18

This question was well-answered by many candidates, although some were uncertain as to whether fibrin is converted to fibrinogen (incorrect) or fibrinogen to fibrin (correct).

Question 19

Many candidates chose the correct option. Incorrect responses suggested that the term 'passive' was not understood by all.

Question 20

While most candidates understood what muscle action is required for inspiration, some were uncertain as to which way round the external and internal intercostal muscles work.

Question 22

This was a challenging question and it was pleasing that many candidates selected the correct option. However, a number showed less secure knowledge of which substances are filtered out of the blood in the kidney and the fact that respiration in the tissues of the kidney would result in lower concentrations of glucose and oxygen and a higher concentration of carbon dioxide in the renal vein than in the renal artery.

Question 26

Although many candidates chose the correct option, some wrongly believed that heroin is a stimulant.

Question 28

While many candidates derived the correct answer, some incorrectly believed that the zygote of the sheep was haploid and would therefore possess 27 chromosomes. A few doubled the diploid number and opted for the zygote possessing 108 chromosomes.

Question 29

Many candidates correctly identified the mitochondrion as providing the energy to enable the sperm to swim. The commonest incorrect response was the flagellum.

Question 33

Although many candidates chose the correct option, some incorrectly believed that genotype Hb^AHb^A would increase an individual's resistance to malaria.

Question 37

Many candidates were aware that the fact that bacteria mutate frequently is a disadvantage of using bacteria to produce insulin. Some thought that the fact that bacteria share their genetic code with other organisms was a disadvantage.

BIOLOGY

Paper 0610/23
Multiple Choice (Extended)

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

General comments

The paper provided a balance of questions and sufficient challenge for candidates working at this level. Common misconceptions were identified and are detailed against individual questions. Good knowledge of many areas of the syllabus was demonstrated by the majority of candidates.

Comments on specific questions

Question 1

Although many candidates appreciated that all animals and plants carry out the characteristics of living things, some also believed that only animals carry out these characteristics.

Questions 3, 4, 5, 6, 7, 9, 11, 12, 13, 14, 15, 23, 25, 27, 33, 35, 38 and 40

These questions were well-answered by the majority of candidates.

Question 8

While many candidates correctly identified that it is the surface membrane that is partially permeable, some incorrectly opted for the cell wall.

Question 17

While many candidates were able to identify the correct graph which shows the results of the experiment, many opted for an incorrect graph. It is important that candidates work methodically through the information given.

Question 18

The question was well answered by many candidates, although a similar number chose an incorrect option. There was some uncertainty whether fibrin is converted to fibrinogen (incorrect) or fibrinogen to fibrin (correct).

Question 19

Many candidates chose the correct option. Incorrect responses suggested that the term 'passive' was not understood by all.

Question 20

While most candidates understood what muscle action is required for inspiration, some were uncertain as to which way round the external and internal intercostal muscles work.

Question 22

Many candidates correctly identified the renal vein. The renal artery was a common incorrect response.

Question 24

Most candidates were able recall the activities of the structures involved in viewing a near object. However, this proved to be a challenging question for many.

Question 26

Many candidates were uncertain about which region of the shoot would show the greatest rate of growth.

Question 28

While many candidates chose the correct option, some were less secure in their knowledge of these reproductive techniques.

Question 29

Some candidates selected the correct response but many could not identify the curve representing progesterone.

Question 30

Most candidates were able to work through the information given and derive the correct answer. However, many found this challenging.

Question 31

Most candidates were able to work systematically through the information and derive the correct answer.

Question 34

While many candidates chose the correct option, some believed that xerophytes have a thin cuticle and many stomata.

Question 36

Some candidates were able to recognise the definition of a community. Many were unsure of the definitions of a community, an ecosystem and a population.

Question 37

While many candidates appreciated that the presence of plasmids makes it possible for bacteria to produce human insulin, some wrongly believed that bacteria possess genes for insulin.

Question 39

This proved to be a challenging question for many who did not recall that decomposer bacteria lower the oxygen concentration of water during eutrophication.

BIOLOGY

Paper 0610/31
Theory (Core)

Key messages

Candidates should read questions really carefully and make sure they are following all instructions given. The space provided and the number of marks available indicates the length and type of response required. Where extra space is required candidates should ensure that they have noted in the question where on the script they have written the continuation of their response.

Candidates should know the difference between command words, e.g. state, describe, explain, calculate and suggest so that they can respond to the question appropriately.

General comments

Most candidates were well-prepared for the exam. A good knowledge and understanding of many areas of the syllabus was shown.

Comments on specific questions

Question 1

(a)   Most candidates performed well on the question. The two processes that some found challenging were phagocytosis and blood clotting. Some candidates only drew five lines rather than the required six often the missing line was the second line going to the white blood cell.

(b)(i)   Generally well-answered.

(ii)   The function of stomata was not universally known. Some responses lacked sufficient detail, such as citing a gas but omitting the direction in which it travelled. One misconception was that water would enter the plant through the stomata.

Question 2

(a)   This question proved challenging for some candidates. Many definitions were incomplete as they did not make reference to the production of genetically different offspring. Some incorrectly referred to sexual intercourse.

(b)(i)   A common error was to state 'anus'; the point of exit of faeces rather than where it is transport. Sperm duct was better known. While many responses correctly distinguished between the urethra and the ureter this was a common source of error. Due to the similarity of these words only precise spelling was accepted.

(ii)   The prostate gland was often confused with the seminal vesicle. Significant numbers did not attempt to label the prostate gland at all.

(c)   Some responses confused the scrotum with the testes. The most common incorrect responses were producing sperm or carrying sperm. Some did refer to temperature but did not state that the testes require a lower temperature than the rest of the body.

Question 3

Nearly all candidates knew that neurones are cells that are part of the nervous system. Most named the motor neurone as the third type neurone. Sometimes the option 'stimuli' was chosen in error for 'impulses'. Not all were aware that the junctions between neurones are called synapses. Most were aware that reflex actions are fast.

Question 4

(a) This proved challenging with few able to recall the correct word equation.

(b)(i) Most candidates gave the correct value from the graph.

(ii) Most candidates were able to give one effect but few gave two correct effects of a reduction in energy.

(c) Some responses lacked sufficient detail to meet the requirements of the marking points. Others compared males and females in the same age group which unfortunately did not answer the question.

(d) Surprisingly few scored both marks. The most common correct responses were baking and brewing.

Question 5

(a)(i) Most candidates did well on the question. A common error was to draw a pyramid instead of a food chain but very few of these had the correct shape. Most candidates remembered to put in arrows and most were the correct way round.

(ii) The majority of candidates gave the correct response.

(iii) Most candidates gave the correct response.

(b)(i) The most frequent correct responses were habitat destruction, hunting, lack of food, no mates, more predators and disease.

(ii) Most candidates gave a suitable response.

Question 6

(a) Many found this question challenging.

(b)(i) A common misconception was that teeth break down molecules rather than food. The question required two functions, where more than two were given only the first two were considered.

(ii) Some responses again made reference to the break down of molecules which was incorrect. Many referred to swallowing but few made reference to the increased surface area of the broken down food.

Question 7

(a)(i) Most candidates could identify a petal but fewer could identify an ovule. A common error was to label the ovary rather than an ovule.

(ii) The most frequent error was to put petals instead of sepals.

(b) Most candidates drew the correct line from the anther of a flower to the stigma of another. A common error was to connect two stigmas. Another common error was to draw a line instead of an arrow.

(c)   Most candidates gave two correct visible features. The commonest error was to refer to structures that were not visible such as scent or nectar.

(d)   Most candidates were able to recall some of the structures involved in the pathway; the most well-known being the root hairs and xylem. Many also made reference to osmosis but not always in the correct context i.e. osmosis occurring the xylem vessels. Few mentioned the cortex or mesophyll. Many went on to discuss water exiting the leaves and transpiration which was not required. Common misconceptions included making reference to the phloem as being part of the pathway or water entering the stomata and travelling to the roots.

Question 8

This question was well-answered by the majority of candidates.

Question 9

(a) (i)   Some candidates found reading values accurately off the graph challenging but most gave two correct times.

(ii)   Most candidates answered this correctly.

(iii) Many candidates successfully linked availability of light to photosynthesis and thus absorption of carbon dioxide. Some only wrote about sunrise and photosynthesis or photosynthesis and carbon dioxide absorption. A few seemed unaware that respiration is still going on alongside photosynthesis, or thought they were alternative processes. A few thought that carbon dioxide was decreasing as the light intensity was decreasing.

(b)   Most candidates were able to state one environmental factor but fewer could give two.

Question 10

(a)   Candidates did well on this question. Many correctly identified the Merino and gave a satisfactory reason for their choice.

(b)   It was pleasing to see that most candidates gave correct responses for this question and showed a good understanding of the process of selective breeding and were able to apply their knowledge in this context. Common errors included stating that the process (of mating and selecting offspring with the desirable features) would be repeated but not that it would need to be repeated for a number of generations or making reference to genetic engineering techniques that did not take into account the context of the question.

BIOLOGY

+---------------------------+
| **Paper 0610/32** |
| **Theory (Core)** |
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Key messages

Candidates need to read each question carefully, particularly the information given at the beginning of the question.

General comments

There was an improvement in the way data-handling questions were answered.

Comments on specific questions

Question 1

(a)   This question was answered well by most candidates. The prostate gland was sometimes confused with the bladder.

(b)   Candidates showed an excellent understanding of reproduction with many giving a lot of extra information. The question only required the details of the path not the role of sperm.

(c) (i)   Most candidates were aware that the chromosome carries genetic information. A few responses showed uncertainty about the difference between genes and DNA.

(ii)   Most candidates recognised that the sex chromosomes could be X or Y, the commonest error was to give the sex chromosomes found in the zygote.

(iii)   This question was well-answered and many candidates. Good responses that stated 'head' went on to describe how it was adapted rather than just giving the structure.

Question 2

(a) (i) and (ii)
       Many candidates gave the correct response.

(iii)   The best responses used the information about chlorophyll provided in the question to arrive at a valid conclusion. Less successful responses did not consider the information given.

(b)   Many candidates were able to link the requirement for light to photosynthesis and a few also recognised that in the absence of light the starch would be used up.

(c) (i)   This question was answered well with many not only recognising the role of root hair cells but also that osmosis and semi-permeable membranes were involved.

(ii)   Many candidates correctly gave a function of water in a plant. One misconception was to relate it to translocation and nutrition.

(iii)   An excellent understanding of xylem as a transport tissue was shown.

(iv)   Most gave the correct response to this question. The commonest error was to name a structure within the leaf.

Question 3

The data analysis question was correctly and clearly answered by most candidates.

(a) (i) All candidates gave a correct date.

(ii) Most candidates read the correct value from the graph.

(iii) There were some excellent descriptions of the trend.

(b) Some candidates were able to recognise the genus. Many gave the species name.

(c) Many responses described the prevention of diarrhoea and a healthy diet rather than treatment of diarrhoea.

(d) Most candidates gave a correct response to this question.

Question 4

(a) Many correctly shaded the iris.

(b) Many candidates completed the diagram correctly.

(c) (i) Some candidates gave the correct response. A common error was to describe the response rather than the stimulus.

(ii) A few candidates gave the correct effector.

Question 5

(a) (i) Many candidates correctly gave **K** and **M** as representing respiration. The commonest error was to include **L**.

(ii) Many candidates correctly gave the correct response. A common misconception was that fossil fuels respire.

(iii) Most candidates gave the correct response.

(b) This question was answered well.

(c) (i)(ii) Candidates demonstrated an excellent understanding of deforestation.

(d) (i) Most candidates were able to manipulate the data correctly, with only a few minor errors.

(ii) Excellent answers were given by most candidates.

(iii) Although candidates made good attempts to answer this question, many answers focused on the endangered species rather than the forest itself.

Question 6

(a) A really well-answered question.

(b) Many excellent responses were seen. The best responses qualified the feature they had identified to show how they were adapted, e.g. having lots of capillaries rather than just stating capillaries.

(c) (i) The best responses qualified their descriptions by making it clear that there was more of less of the substance described.

(ii) Most candidates gave the correct response. A common misconception was that there was no difference between breathing and respiration.

(d)   Candidates were able to give an example of a cell and an organ. The commonest error was to give examples from other parts of the body which did not answer the question.

Question 7

(a)   Most candidates answered this well.

(b)   While most candidates understood the relationship between volume and concentration of urine when water intake increases, the relationship between temperature and exercise was less well known.

(c) (i)   Some found it difficult to define growth without using the word *grow* instead of *increase.*

(ii)   An excellent understanding of the characteristics of living things was shown.

Question 8

(a)   This was a challenging question with only a few responses offering a correct explanation.

(b)   Many candidates correctly identified examples of discontinuous variation.

(c)   This question was well-answered.

BIOLOGY

Paper 0610/33
Theory (Core)

Key messages

The space provided and the number of marks available indicates the length and type of response required. Where extra space is required candidates should ensure that they have noted in the question where on the script they have written the continuation of their response. It is important that all of the instructions in a question are followed.

Candidates should know the difference between command words, e.g. state, describe, explain, calculate and suggest so that they can respond to the question appropriately.

General comments

Most candidates were well-prepared for the exam. A good knowledge and understanding of many areas of the syllabus was shown.

Comments on specific questions

Question 1

(a) Most candidates gave a correct feature.

(b) (i) Generally well-answered. One misconception was that crocodiles were amphibians.

(ii) Again, generally well-answered.

(iii) Most candidates gave a correct response.

(c) While most candidates gave correct responses a common error was name individual organisms rather than the group to which they belong.

Question 2

(a) (i) This proved to be a challenging question with few able to state the correct word equation for photosynthesis.

(ii) A common error was to state chloroplast, which is the structure containing the pigment.

(b) (i) Most candidates gave the correct response.

(ii) Most candidates gave two correct values.

(iii) Some candidates calculated the correct value and some gain only the mark for workings.

(c) Many responses gave the marking point about rising and falling and some went on to state that there were no bubbles at 40(°C). Very few gained all three marks.

(d) Many candidates stated a correct factor. Where the response gave more than one factor, only the first in the list was considered.

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Question 3

(a)   Most candidates gave suitable suggestions and this question was well-answered.

(a)(ii)   Again this question was well-answered by the majority of candidates.

(b)   Many candidates gave five correct responses. Although thought that oranges and lemons are a good source of Vitamin D instead of Vitamin C.

(c)   This was proved challenging for some candidates. It required an explanation and often a list of requirements was given with no reason as to why they were needed which was insufficient.

Question 4

(a)(i)   Some candidates were able to define the term but many could not.

(ii)   This question was well-answered by the majority of candidates.

(b)(i)   Most correctly identified the skin. The commonest incorrect responses included; cell wall, mesoderm, fat and antibodies.

(ii)   This proved to be a challenging question. Few responses completed the whole table correctly, suggesting that the roles of the components of blood were not well-understood by all.

(c)   A few candidates could recall the chemical barriers but many could not.

Question 5

(a)   Despite candidates being given the words to choose from, some still included words not on the list However this was generally well-answered. A common mistake was to give decomposition for process C.

(b)(i) and (ii)
        Here, not all candidates followed the instructions given. Common errors included; drawing a line instead of an arrow therefore not indicating the direction, drawing the arrow in the opposite direction, not labelling the arrow with a letter.

(c)(i)   Although this is a topic of worldwide importance, relatively few could give two possible reasons for the increase in carbon dioxide concentration in the atmosphere.

(ii)   This question was challenging for many. Some referred to the ozone layer, lack of oxygen and general references to pollution. Many referred to the greenhouse effect rather than the enhanced greenhouse effect which was insufficient.

(iii)   Only a few could name another greenhouse gas.

Question 6

(a)(i)   Some candidates could recall the correct type of cell division.

(ii)   Some gave the correct response but many were unable to recall it and common wrong answers included; embryo, foetus, baby and gene.

(b)(i)   Some candidates gave the correct definition for the term.

(ii)   Many responses gave the phenotype rather than the dominant allele.

(c)   This was a challenging question and only a few responses provided a suitable description.

(d)   Some candidates successfully completed this question but a significant number found it challenging.

(e)   While some candidates were able to successfully describe the stages many described techniques involved in genetic engineering. There were many of descriptions of mating and the subsequent births of offspring. Many responses just stopped once the parents had been chosen and bred or suggested that all of the offspring would have the desired characteristics. Some wrote that the process needs to be repeated but not that the repetition was done for many generations.

Question 7

This topic (sewage treatment) was not well-understood by all.

(a)   The answer looked for sources of water pollution not what the pollutant was.

(b)   Most candidates knew that sewage is filtered but fewer could provide further detail of how sewage is treated.

(c)   Few could define this term correctly.

Question 8

(a)   Most candidates could identify the parts of the female reproductive system.

(b)   Most candidates could identify the ovaries. The commonest incorrect structures given were the oviduct or the uterus.

(c)   Many candidates gave the correct response. The commonest incorrect structures given were the ovary, cervix, uterus and uterine wall.

BIOLOGY

Key messages

- Consider all the information provided in a question when formulating a response to the question.
- There is no need to write out the question at the beginning of a response.
- Candidates often use blank pages and spaces to continue their responses. Instead of using asterisks or arrows it is better to state on the question the page number on which the continuation has been written.

General comments

There were some exceptionally good scripts and candidates were well-prepared for the exam. Time spent on thinking and planning would have aided responses to unfamiliar material, especially questions **3(b)** and **4(b)(iv)**. Information given in question **5(c)** was often more appropriate for question **5(d)**.

Candidates showed a good understanding of the requirements for each command word. In particular it was good to see that very few explained concepts when asked to describe them; when asked to suggest many made a logical extrapolation of their knowledge to apply it to an unfamiliar situation. Many also gave concise answers in response to the command word 'state'.

Comments on specific questions

Question 1

(a)   Many candidates identified the molecules shown in Fig. 1.1 correctly. The enzyme-substrate complex (**C**) was the least well-known term. Some candidates identified the active site (**B**) as the enzyme even though that term was given in diagram. 'Substance' was a common incorrect response for 'substrate'.

(b)   Many candidates gave a correct response to this question. A common error was to omit the term molecule; for example, some responses discussed the breakdown of 'particles' and 'substances' and others described the role of mechanical digestion. Some responses did not clearly distinguish between the two types of digestion.

(c)   Many candidates completing Table 1.1 correctly. Common errors were to give the stomach as the site of maltose digestion, the pancreas as the organ that secretes bile and the salivary glands as the site of starch digestion, possibly they were thinking about the source of amylase rather than the site of digestion.

Question 2

(a)   Few responses gave the full definition of the term *fitness*. Many referred simply to survival of an organism in its environment or habitat and did not refer to the increased probability of reproduction as well. Others stated that fitness is to do with having a balanced diet or with physical attributes, such as strength. Some thought fitness referred to an organism's ability to adapt to an environment.

(b)(i) Many candidates gave two suitable features. Common responses referred to 'thin legs', 'large ears' and some candidates gave 'small size' which on its own was insufficient; some gave large surface area: volume ratio which was more appropriate. A few referred to behavioural adaptations such as seeking shade in the daytime or living in a burrow.

(ii)   Many suitable features were given. Good responses included the large number of rods in the eyes and the presence of whiskers.

(c) (i) Candidates often drew two extra blocks representing detritivores and carnivores on the pyramid of biomass in Fig. 2.2, even though the labelling indicates that the biomass of the herbivores and detritivores had been combined to form the second block. Most of the blocks were carefully centred. Many responses did not consider the scale and drew blocks that were too large. Many also did not label the drawn block.

(ii)   Many responses explained that the detritivores in this desert ecosystem feed on plant matter or are primary consumers like the herbivores. The fact that they are eaten by carnivores was not a reason for placing detritivores in the same block as herbivores.

(iii)   There were many good responses that referred to energy flow as the reason for the limit to four or five trophic levels in ecosystems. Many stated that only 10 per cent of the energy entering a trophic level is available to the next trophic level and gave suitable reasons to account for this. The idea that not enough energy reaches higher trophic levels was less well appreciated. Many, however, explained that no animals exist that can prey on top consumers.

(iv)   Candidates found it challenging to explain the advantages of a pyramid of biomass over a pyramid of numbers. Many simply stated what is shown by each type of pyramid. However, others stated that pyramids of numbers do not take into account the size or mass of organisms, often giving an example such as large numbers of caterpillars that can feed on a single tree. Many only gave partial responses to this question by stating that producers may be very large and have greater biomass. Some considered biomass to be the same as energy, but these were often accepted if they stated that a pyramid of biomass gives an indication of the energy available in each trophic level. One misconception was to state that pyramids of biomass show the transfer of energy, which they do not. Simple sketches would have supported less confident responses about the shapes of the pyramids.

Question 3

(a) (i) Many candidates labelled the central star-like region of the cross-section of the root as the xylem. Common errors were to label the cortex or the phloem. Some label lines to the xylem only just reached the outer line of the 'star' rather than ending clearly within the area of xylem. Some used arrow heads which sometimes made it difficult to interpret which area they were pointing at.

(ii)   Many candidates were able to give a suitable response but some were not familiar with the definition of the term tissue.

(b)   Some candidates found this question challenging. Some responses described how water is transported in the xylem and how the structure of a leaf is adapted for photosynthesis which did not answer the question. Most stated that the spongy mesophyll has air spaces, but few described the large internal surface area of the mesophyll cells and the evaporation of water from these surfaces. Although most understood that water moves out through stomata, many did not state that it is water vapour that diffuses out. There were also incorrect references to 'water evaporating out of the stomata'. Few linked the guard cells to the stomata and guard cells were often described as opening rather than the stomata opening.

Question 4

(a) (i) Many candidates gave the correct response.

(ii)   Few candidates identified all three blood vessels correctly. Most identified the capillary (**T**), but most identified **Q** as a vein instead of a venule and **S** as an artery instead of arteriole.

(iii)   The majority of candidates gave the correct response. Incorrect responses included myelin and myelin sheath.

(b)(i)   There were many excellent descriptions of the effect of increasing the temperature of the skin surface on blood flow to the skin without capsaicin. Most of these responses used the units from Fig. 4.2 correctly. However, some responses compared the effects of the two treatments or explained these differences rather than describing the effects on the blood flow in the untreated volunteers. Some responses gave data quotes with no further description. Some responses gave correct readings of values from the graph. A common error was to read 41°C on the graph as 40°C or 42°C. Many responses described an overall increase with no reference to the constant blood flow at the lower temperatures shown on Fig. 4.2.

(ii)   There were few detailed responses to this question. Most knew that vasodilation is involved in the skin's response to increased temperature and some knew that it is arterioles that dilate to increase blood flow through the capillaries near the surface of the skin. A common error was reference to 'capillaries dilating'. Few responses explained the roles of arterioles and shunt vessels. Many referred to the role of receptors and sensory neurones, the best responses went on to discuss impulses travelling along motor neurones to the rings of muscle on the blood vessels. Only some responses described an increase in blood flow in capillaries near the surface of the skin (as shown in Fig. 4.1). A common error was to describe blood vessels 'moving up towards the surface of the skin'.

(iii)   The majority of candidates gave the correct response.

(iv)   This was a challenging question for some candidates. The best responses made correct reference to diffusion of capsaicin down a concentration gradient. Some good responses made full use of all the information provided in the question and referred to the structures through which capsaicin had to pass in order to reach the receptors.

(c)   Some responses to this question explained how the body temperature is controlled rather than explaining its importance. Most recognised the effect of deviations in optimal body temperature on enzyme activity. Good responses linked the effects of temperature changes on enzymes to the rate of metabolic processes, such as respiration and chemical digestion. The best responses referred to other effects including; dehydration, heat stroke and the effect of high temperature on sperm production.

(d)   This was answered well by the majority of candidates. Less well-executed responses described the features of the nervous system and made little or no reference to hormones. Others gave a description of the reflex arc, which was not relevant.

Question 5

(a)   The vast majority of candidates were familiar with the chemical equation for aerobic respiration. A few wrote the equation for photosynthesis and not all were able to correctly balance the equation. Some gave an equation for anaerobic respiration.

(b)   There were some correct calculations. Many calculated the correct difference between walking and trotting but then chose the wrong value as the denominator. In some cases partial credit could be awarded because the response showed the correct working despite arriving at an incorrect final value. This highlights the importance of showing working when prompted to do so.

(c)   Many explanations of the oxygen debt stated that 'the horse' or 'the body' respires anaerobically instead of making it clear that the change from aerobic to anaerobic respiration occurs in muscles. Many stated correctly that lactic acid is produced. Common errors included confusing respiration with breathing and stating that the 'body produces oxygen'. Some also wrote in general terms about carbon dioxide and sometimes about its effect on blood pH, which was not relevant to the question.

(d)   Many responses stated that the horses would continue to breathe faster and/or deeper and would have a fast heart rate in order to recover from the oxygen debt. A common error was to state that lactic acid is broken down within muscle tissue rather than diffusing into the blood to be transported to the liver where it is oxidised. The role of oxygen in this process was not well-understood. Others misinterpreted the question and described how the horses should be provided with rest and water to recover from the exercise.

Question 6

(a) (i)   There were many correct responses. The most common incorrect response was **T** (uterus) as the site of fertilisation.

   (ii)   The majority of candidates gave the correct response. Ovary was the most common incorrect response.

(b)(i)   The majority of candidates gave the correct response. Some incorrect responses gave the size of the image as a percentage of the actual image which was not what was required.

   (ii)   There were many incorrect responses to this question ranging from $5.5\,\mu m$ to $0.5 \times 10^{-8}\,\mu m$.

(c)   Most candidates stated that sperm cells are haploid or that they contain 23 chromosomes. However, very few went on to give an *explanation*, either in terms of the production of sperm cells by meiosis, or that this ensures the number of chromosomes remains constant from generation to generation. Some candidates stated incorrectly that sperm cells are haploid because they divide by meiosis.

(d)   There were many excellent explanations of the roles of the three parts of the sperm cell. Most stated that the flagellum propels the sperm towards the oviduct or towards the egg. Fewer stated that mitochondria are the site of aerobic respiration and provide energy for this movement. Several misconceptions were seen. Fewer knew the role of the acrosome as a store of enzymes, although many stated that the role of the acrosome is to ensure that sperm and egg nuclei can fuse together. Common errors seen included; stating that the acrosome is an enzyme rather than it contains enzymes, suggesting that the acrosome is used as a navigation tool to find the egg, stating that the enzymes digest the egg cell membrane so that the whole sperm can enter the egg and describing digestion of the cell wall rather than the jelly coat.

(e)   There were many good accounts of the role of the father in sex determination. Errors included stating that X and Y are genes or alleles rather than chromosomes and not making clear the difference between the sex chromosomes in diploid cells and in gametes. Another misconception was that the Y chromosome is 'dominant' to the X, and/or that the X chromosome is 'recessive'.

BIOLOGY

> **Paper 0610/42**
> **Theory (Extended)**

Key messages

- Some questions require candidates to give descriptions or explanations. The best responses identify the relevant points and link them together logically to give a clear account.
- Candidates often use blank pages and spaces to continue their responses. Instead of using asterisks or arrows it is better to state on the question the page number on which the continuation has been written.

General comments

There was a full range of responses which demonstrated all the points required by the mark scheme. Although many candidates were well-prepared to answer questions on the entire syllabus, some responses indicated less familiarity with methods of contraception and the significance of barrier methods of birth control in the prevention of spread of sexually-transmitted infections in responses to question **4**.

Comments on specific questions

Question 1

(a) (i)   Almost all candidates knew the structure of a tooth and the names of the different types of mammalian teeth. Cement (**B**) was the least well-known in Fig. 1.1. Common errors included writing 'dental' for dentine for **A** and transposing the positions of molars and pre-molars or the incisors and canines as shown in Fig. 1.2.

   (ii)   Most candidates identified the correct type of digestion. Common incorrect responses included; ingestion, mastication and chewing.

(b) (i)   The fact that acid is released by bacteria to cause tooth decay was also well-known. Common incorrect responses included; plaque and sugar.

   (ii)   The two parts of a tooth that are dissolved by acid were slightly less well-known. Dentine was less well known than enamel. Some candidates suggested both enamel and the crown, which are essentially the same part of the tooth.

(c)   Most candidates suggested that sugars are the part of a human diet and are used by bacteria to cause tooth decay.

Question 2

(a) (i)   Many candidates were familiar with the definition of fitness. 'Survive and respire' was sometimes seen instead of 'survive and reproduce'.

   (ii)   There were many sensible suggestions for this question. Although some confused seed dispersal with pollination and others suggested that mangrove seeds float in order to photosynthesise.

(b) (i)   Many candidates could calculate the mass of one fiddler crab, but fewer gave their answer to two significant figures.

   (ii)   Many correct sketches of a pyramid of numbers were seen. The most common mistakes were to omit the numbers and labels for the trophic levels. In some response the trophic levels were incorrectly reordered to achieve a pyramid shape.

(iii) The best responses explained fully the difference in shape between the pyramid of biomass and the pyramid of numbers. However, many described pyramids of energy and the energy loss between trophic levels which was not relevant. Good responses made good use of comparative data. Less well-executed response repeated the information for the pyramid of numbers sketched in the previous question and did not compare this with the biomass data.

Question 3

(a) (i) Many candidates knew that sucrose and amino acids are transported in phloem. A common error was to give two different sugars, omitting the reference to amino acids. The transport of starch was another less common error.

(ii) Many candidates knew the terms source and sink and used these words to explain the role of phloem in plant transport. Some seemed to be unfamiliar with these key terms and answered the question in terms of sucrose 'sinking down the phloem'. Many attempted to demonstrate their understanding that sources and sinks could change at different times of the year, but responses often lacked clarity. One error was to suggest that the soil is the source of nutrients or that it is transported in the phloem.

(b) The long response question on the function of xylem and its adaptations was answered well by most candidates. Some marking points were not seen very often. Candidates rarely stated that thickened cell walls prevent inward collapse of xylem vessels or that the lack of end plates or end walls decreases the resistance to flow of water. A common misconception was that water movement in the xylem due to osmosis.

(c) The best responses explained the benefits to farmers of killing pests. The most common correct responses explained the reduction in damage leading to an increase in yield.

Question 4

(a) (i) Many candidates applied their knowledge successfully to answer this question, although quite a few referred to pathogens or to diseases in general without any specific reference to STIs. Common misconceptions were that contraceptives cause infections and that they are able to destroy pathogens. Common omissions were not to give examples of STIs or to state that *some* contraceptives reduce the risk of infection. Instead, many responses implied that all contraceptives reduce the risk of infection. One error was to describe the prevention of pregnancy rather than the prevention of disease.

(b) (i) Many candidates knew the two hormones found in contraceptive pills. The most common errors were to suggest LH or testosterone.

(ii) Few responses explained fully why FSH is not found in contraceptive pills. Most candidates, however, linked FSH with follicle development and an increased chance of ovulation. Common errors were to state that FSH causes the production of eggs or follicles rather than stimulating development or growth. Some stated that whole follicles are released at ovulation rather than just the egg.

(iii) Many were able to give the name of another contraceptive that contains chemicals. A common error was to describe surgical or barrier methods of contraception. The most common correct response was spermicides.

(iv) Some candidates were able to suggest other contraceptive methods. The most common correct responses were examples of surgical or natural methods.

(v) Some candidates interpreted the data sufficiently to explain the apparent discrepancy in the data in Fig. 4.1. A common misinterpretation of the data in the survey was to suggest that there were more methods not included in the survey.

Question 5

(a)   The distinguishing features of insects were well-known. A common mistake was to fail to state how many body parts are common to insects, an important distinguishing feature from other arthropods. Hair was also often given incorrectly as a distinguishing feature.

(b)   The vast majority of candidates were familiar with the chemical equation for aerobic respiration. A few wrote the equation for photosynthesis and not all were able to correctly balance the equation.

(c) (i)   Many candidates seemed to be familiar with the experiment shown in Fig. 5.2 and were able to complete the sentences to explain how to use a respirometer. The most common misconception was to suggest that the water-bath is used to increase, rather than to maintain a constant temperature.

(ii)   A similar number of candidates also explained why soda lime is put in the bottom of the respirometer.

(iii)   Many good examples of the uses of energy were given. A common error was to give general responses rather than to think about the context in which this question was set. For example, many suggested that the larvae in the respirometer were reproducing or flying or that energy is used to maintain body temperature. The most common correct answers were growth and movement, some reflected on what they had learnt about energy usage and gave excellent examples including protein synthesis and active transport.

(d)   Candidates familiar with making predictions and explaining them gave detailed responses to this question. Many stated that respiration would increase as temperature increased, but not all went on to state that respiration would decrease at higher temperatures. Many explained their predictions in terms of enzyme activity and denaturation with some correctly referred to kinetic energy.

Question 6

(a)   Most candidates identified the process shown in Fig. 6.1 as reproduction.

(b) (i)   Many candidates knew the formula to calculate the actual size of an organism from a magnified image. Some knew the standard equation but were unable to rearrange the formula successfully.

(ii)   Some knew how to convert millimetres to micrometres with many incorrectly dividing by the conversion number rather than multiplying by it. A number of candidates wrote their answers in standard form as 8×10^{-1} but a common error was to express the answer as 8×10^{-10} instead.

(c) (i)   Many candidates gave a correct response to this question.

(ii)   Although most responses explained part of the process of producing human proteins in bacteria, only a few gave a fully detailed and accurate account. Key words and enzymes were often remembered, but not used in the correct context. Only the best responses used the term gene correctly. Some used the terms protein and DNA interchangeably implying that were the same structure. A common omission was to not refer to using the *same* restriction enzyme for cutting both the human DNA and the plasmids. Another omission was to not make it clear that plasmids were used; simply stating that DNA is inserted into the bacteria.

(d) (i)   Some good suggestions were seen. Often responses explained that the steam denatured the enzymes, but did not go on to state that this killed the bacteria.

(ii)   Most candidates knew at least some of the conditions in a fermenter that are controlled and measured. The most common error was to suggest the control of light intensity. The most common correct responses were temperature and pH.

(iii)   Although penicillin was the most common correct response, a wide variety of other commercial products made in fermenters were given. The most frequent incorrect responses were *Penicillium* and bread.

(e) An extensive range of advantages were suggested. Some responses lacked precision; stating in general terms that genetic modification adapts crop plants to the environment. These statements were often not specific to genetically modified crops and could be true of crops grown as monocultures or crop species improved by selective breeding.

BIOLOGY

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Paper 0610/43
Theory (Extended)
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Key messages

- Some questions require candidates to give descriptions or explanations. The best responses identify the relevant points and link them together logically to give a clear account.
- Candidates often use blank pages and spaces to continue their responses. Instead of using asterisks or arrows it is better to state on the question the page number on which the continuation has been written.

General comments

There was a full range of responses which demonstrated all the points required by the mark scheme. Although many candidates were well-prepared to answer questions on the entire syllabus, there was some evidence that not all were familiar with some of the aspects relating to plants, such as the use of 2, 4-D in agriculture (question **4(e)(ii)**), the changes taking place in cells when a leaf wilts (question **3(b)(ii)**) and the adaptations of a leaf (questions **3(a)(ii)** and **3(a)(iii)**).

Comments on specific questions

Question 1

(a)   Almost all candidates knew that mechanical digestion starts in the mouth, but only the best responses gave a detailed description. Many descriptions focused on chemical digestion. Very few gave details of the roles of the different types of teeth.

(b)   Many were familiar with at least some of the digestive enzymes and the products of chemical digestion. Amylase was the most well-known enzyme although some responses did not state the products of starch digestion. The location of fat digestion was the least well-known.

(c) (i)   Some candidates knew the storage carbohydrate in the liver. A common error was glucagon. Correct spelling of glycogen was important to differentiate it from glucagon.

   (ii)   Many candidates knew the correct response.

   (iii)   Almost all candidates suggested a suitable function for the fat layer beneath the skin. The most common misconception was that the fat layer would produce heat rather than provide insulation.

Question 2

(a) (i)   Many candidates knew that fur is one visible feature of mammals, but only a few suggested a correct second feature. Where more than two features were given in a response, only the first two were considered. Features which were not visible or were not distinguishing were often seen. A considerable number suggested that having four legs and a backbone were unique to mammals.

   (ii)   Many good explanations of the term adaptive feature were seen. Almost all candidates explained that adaptive features increase chances of survival. Less well-executed responses just described the adaptive features of wolves. Some did not extend their explanations to cover all aspects of an adaptive feature; the genetic link in the context of natural selection and reference to fitness were the most common omissions.

(b)   Almost all candidates knew some conditions that limit plant growth. Responses that used very general terms such as 'weather' or 'environment' were rare.

(c)   There were many good responses to this question. The most common points made were the lack of food and the low reproductive rates, but a broad range of valid points were made. Less well-executed responses tended to state the same point multiple times or lacked sufficient scientific detail.

Question 3

(a) (i)   Even though the three-dimensional image of the broad bean leaf was likely to be unfamiliar, many candidates identified successfully the two labelled tissues in the photomicrograph. A common error was to state that the epidermis (**A**) was the cuticle.

(ii)   Good responses were able to explain why the mesophyll tissues have a large surface area or considered the optimisation of either light absorption or gas exchange. Only the best responses considered both aspects.

(iii)   The best responses provided a detailed account of why there are interconnecting air spaces in a leaf. Many realised that it would be related to diffusion and the processes that occur in a leaf, but were not able to construct a response in sufficient detail.

(b) (i)   Many suggested one correct condition that could increase the chances of wilting, but only a few gave two correct conditions. A significant number of candidates stated an abiotic factor without qualifying it; for example, many gave humidity without stating *low* humidity. A common misconception was that the absence of light would cause wilting.

(ii)   Explaining what happens to leaf cells to cause wilting proved to be challenging. There were some very good responses, but many gave lacked sufficient detail stating only that cells loose turgor or become flaccid but offering no further explanation.

(iii)   The most common correct advantage of wilting suggested was to reduce herbivory, but many other plausible suggestions were also given.

Question 4

(a)   Many candidates gave part of the definition of a hormone, but only some gave a detailed, precise response. Many did not state that hormones are transported in the blood.

(b) (i)   The majority of candidates stated that the retina converts light energy into nerve impulses.

(ii)   Fewer candidates knew that the fovea has the highest concentration of light sensitive cells in the eye. The most common wrong answer was the retina.

(iii)   Many candidates knew that sensory neurones conduct impulses from the eye to the brain. The most common wrong response was the optic nerve, suggesting that some were unsure of the difference between nerve tissue and nerve cells or neurones.

(iv)   Almost all candidates knew that the optic nerve contains the neurones that conduct impulses from the eye to the brain.

(v)   The majority of candidates identified the spinal cord from the diagram. References to the spine, rather than spinal cord were rare, suggesting that most candidates knew the difference between these two terms.

(vi)   A few correctly identified the adrenal gland but it was not widely known.

(c)   Most candidates completed at least part of Table 4.1 to describe the effect of adrenaline on different parts of the body. The effects on the liver were the least well-known. Many responses made general statements about the *eyes* dilating rather than stating that it is the *pupils* that dilate.

(d)   The best responses gave a full explanation. Many referred correctly to the increased speed of the nervous system as well as the long-lasting effects of the endocrine system. Some responses did not make it clear as to whether they were referring to the nervous system or to the endocrine system.

(e) (i) A reasonable number of responses named a plant hormone, but many gave the names of animal hormones.

(ii) Very few candidates knew how 2, 4-D is used in agriculture. Most suggested that it is used to promote the growth of crops without specific mention of its role as a weedkiller.

Question 5

(a) The vast majority of candidates were familiar with the chemical equation for aerobic respiration. A few wrote the equation for photosynthesis and not all were able to correctly balance the equation.

(b) Many candidates calculated the rate of carbon dioxide production and most also went on to give their answer to the correct number of significant figures, however, some found this challenging. Similarly, correct rounding of the calculated value proved to be a challenge for some.

(c) Many excellent explanations were seen, both in terms of concern for the welfare of the crickets and good experimental design.

(d) A similar number of candidates also explained why the temperature in the jar would increase. A broad range of correct points were made with many extending their responses to cover many valid reasons.

(e) Most candidates stated two conclusions from the data in the figure, but fewer were able to support their conclusions with appropriate data quotations. Often where data was quoted there were no comparative figures or units were missing.

Question 6

(a) Many candidates were able to identify at least some parts of the flower, but fewer could correctly identify their functions. The least well-known function was the protection given by sepals to the flower bud.

(b) (i) Many candidates knew the formula to calculate the actual size of a pollen grain from a magnified image.

(ii) Many candidates converted millimeters to micrometers successfully with only a few using something other than a factor of a thousand.

(iii) Almost all candidates suggested that the spikes on the pollen grains would hook on to the bodies of insects to aid pollination.

(c) (i) A reasonable number of candidates knew that the ovule contains the female gamete in flowers.

(ii) Some candidates gave a correct definition. Good responses approximated the definition given in the syllabus. A common error was to state that the chromosome number was 23 without further explanation.

(iii) Some candidates explained in detail why it is important that gametes are haploid with many referring to the restoration of the diploid number at fertilisation. Less well-executed responses seemed to be familiar with the terminology, but were not able to use it in the correct context.

BIOLOGY

> **Paper 0610/51**
> **Practical Test**

Key messages

Candidates should be able to:
*   recognise variables in an experiment and describe how to change the independent variable, measure a dependent variable and describe how to keep any other important variables constant
*   use correct scientific terminology and units for quantities for volume, mass and concentration
*   know the difference between a bar chart and a histogram
*   know how to work out ratios.

General comments

Many excellent scripts were seen with clearly written responses that were precise and direct. If candidates need to cross out an answer, it is better to write the revised answer on a blank part of the question paper if there is not enough space left in the answer lines. Writing over the top of the crossed-out section, particularly over changed numbers, is often difficult to read.

It is important that candidates follow the instructions in the question paper carefully. There were examples in both question 1 and question 2 where candidates appeared to have misread the question, for example in question 1(a) candidates recorded results at intervals of five minutes, rather than intervals of one minute for five minutes. In question 2(b)(i) a great many did not follow the instruction 'label the abdomen' on their drawing.

The supervisor's report is very important in ensuring that candidates are credited appropriately when the results of the experiment do not fit the expected pattern. Chemicals should be new as deterioration can give false results. Supervisors should trial practical materials, as required in the confidential instructions, as far in advance of the actual examination as possible. This gives time, if any difficulties arise, to seek advice about alternative materials from Cambridge, 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' responses appropriately.

Comments on specific questions

Question 1

(a)　　The majority of candidates were able to draw a suitable table, but in many cases were not able to use suitable headings that included appropriate units. A common error was to put units in the body of the table.

Candidates need to know that it is good practice for the independent variable to be the first column or row of a table and the dependent variables should be the next column(s) or row(s). In this question the independent variable was the pH of the tubes A, B and C and the dependent variable the stage of clotting at minute intervals. Candidates should know how to construct tables when a column heading may be further sub-divided. In this question, if candidates made their first column the type of test-tube, the second column would be time / minutes subdivided into columns numbered 1, 2, 3, 4, and 5.

Good responses showed that candidates followed the instruction to record the stage of clotting in each test-tube at one-minute intervals, using the letters given in the question paper, so their tables had fifteen results recorded. Less clear responses often did not use the letters given in the question paper and used other symbols or words without providing a key.

The table was also expected to show a correct trend. The supervisor's results were critical if the candidate's results did not follow the expected pattern.

Some misinterpreted this question in one of two ways. In some cases, results were recorded candidates every five minutes. Credit was given if the table matched the expected criteria. In other cases 'stages of clotting' were used as column headings in the table and the number of minutes taken to reach this stage for each of the test-tubes, P, Q and R was recorded. In these cases the supervisor's results were taken into consideration.

(b) Good responses usually noted that rennin works best in low pH or acid conditions. The best responses also noted that rennin was inhibited at higher pH or basic conditions. Some responses were unclear about the difference between low pH and high pH; a common error was to state that 'the optimum pH for rennin is acid conditions giving a high pH'. Less well-executed responses omitted any mention of rennin and variously answered in terms milk clotting with acid and being unaffected by alkali. A great many simply described their results.

(c) (i) Many candidates gave a correct response, but a large number assumed that 37°C was the optimum temperature of the enzyme or that the enzymes would be activated by the temperature.

(ii) The commonest correct responses were the volume of rennin and the volume of milk. Less well-executed responses simply stated time without any further qualification, others listed equipment such as size of test-tubes and beakers. Candidates need to be able to identify which of the variables in an experiment must be kept constant in order to obtain valid results.

(d) The best responses gave at least three acceptable suggestions. The most common were; the temperature of the water bath not being maintained, contamination from using the same dropping pipette, the difference in volume of drops and not having any repeats. A common mistake was to state an improvement instead of identifying an error or to list human errors such as not carrying out the method correctly.

(e) Almost all candidates gave a correct response, commonly the use of acid.

(f) The majority of candidates gave the correct response. The most common error was to confuse biuret reagent with Benedict's solution. A minority did not appear to know how to test for protein and added more rennin so that extra protein would form clots.

(g) Responses to this question were very variable. Some candidates gave concise answers that described a suitable sequence for testing the effect of temperature on a protease enzyme. They chose a suitable range of temperatures, standardised the pH and volume of enzyme, described how they identify the end point and included a safety precaution. A common error was to state that the experiment should be repeated, but to omit how many times it should be repeated. Some response lacked detail as to how the procedure would be performed. Some responses did not seem to have considered the information in the question and just described how to do the original experiment at different temperatures. The best responses identified the independent variable and how it would be changed, how the dependent variable would be measured and which variables would be kept constant. They also gave a range of values for the independent variable and stated how many times the procedure would be repeated.

Question 2

(a) Most candidates gave correct responses to parts **(i) (ii)** and **(iii)**. The most common error in part **(i)** was to miscount either web B or web E. In these cases, error carried forward was allowed in parts **(ii)** and **(iii)**. In part **(iii)** the most common errors were to divide 102 by 6 or to add 6 to102.

(a) (iv) This proved to be challenging for some candidates. The best responses showed a clear understanding of what is meant by an estimate or the purpose of an average. Good responses showed an understanding that the sample counted was relatively small for the total number of webs or that the sample did not represent the situation in the whole garden. The majority of responses discussed the different size of webs, the variation in the number of insects caught or the unreliability of the estimate.

(b) (i) The quality of drawings varied greatly. There were some excellent examples drawn with a sharp pencil with clear outlines that accurately observed the specimen and made good use of the space provided. Good responses also did not use shading or other artistic edging of lines.

Less well-executed drawings had three body segments instead of two, lacked detail of the segmentation of the legs or extended into the text of the question. Some were also drawn in pen or with a blunt pencil that gave thick sketchy lines.

Good responses showed the relative size of the body in correct proportion to the legs. Measuring the specimen can be helpful when determining the correct proportions of structures. Those who labelled the abdomen usually labelled it correctly, but many omitted this step or drew a label line that did not actually touch the abdomen.

(ii) The majority of candidates measured the line on Fig. 2.2 correctly. Better responses also showed a line drawn on their drawing and a correct measurement for this line. Common errors included omitting the line or the units for the line measurement. Most candidates correctly calculated the magnification from their measurements, although some incorrectly stated the unit for magnification in cm or mm.

(c) (i) Most candidates correctly labelled the axes of the bar chart and used a suitable scale. Candidates were also able to accurately plot data. The commonest error was to draw a histogram (bars touching) instead of a bar chart.

(ii) Most candidates could find the correct total for the number of plants and animals. Many gave a correct ratio, although some did not express it in its simplest form. A common error was to give the ratio of plants to animals instead of animals to plants.

BIOLOGY

| Paper 0610/52 |
| Practical Test |

Key messages

The Practical Test requires candidates to have experience of using a wide range of practical equipment. They should be able to gather valid data and be able to design an experiment that also produces suitable data.

General comments

Successful candidates are able to:

- use a range of practical equipment to gather data that is valid
- be able to justify their choice of equipment and evaluate its accuracy
- design an experiment that takes into consideration the variables, how the data is going to be collected and how the data will be analysed
- present data in a table, with suitable headings that include the appropriate SI units
- present data graphically with a suitable trend line where appropriate
- label graph axes and include the units
- draw an accurate representation of a biological specimen with clear and continuous lines, using a sharp pencil. Drawings should be freehand as ruled lines are usually not appropriate when drawing biological specimens.

Comments on specific questions

Question 1

(a) (i)   Most candidates were able to record a starting and final temperature for the warm and cool water-baths. The most common error was to transpose the two values.

(ii)   It was pleasing to see that most candidates were able to access all the marking points for drawing a table. The best responses provided suitable heading titles and units for the data collected. It is important that the units are recorded only in the table heading and not in the data cells.

(b) (i)   Most candidates were able to draw a relevant conclusion for the investigation. Many stated that as the temperature increased the height of the yeast suspension increased. Some correctly identified that as the temperature increases, so does the rate of the respiration of the yeast.

(ii)   This question proved challenging for some. The commonest error was to discuss the temperature of the water in the water-bath rather than the contents of the small test-tube.

(iii)   Some found it challenging to identify a suitable error in step 7. Many identified a number of experimental errors that were not related to step 7. The best responses matched the improvement to the error identified in step 7.

(iv)   This question was answered well by most candidates. A common error was to provide a list of the controlled variables.

(c) (i)   It was pleasing to see that most candidates were able to correctly calculate the average volume of carbon dioxide produced in five minutes and in one minute.

(ii)   Most candidates were able to draw a good graph with suitable units for the axes. The best responses produced line graphs that had clearly plotted data points with a line that showed no further increase after 4.4 cm^3 per minute.

(iii)   It was encouraging to see that the majority of candidates were able to access the higher marks for this question. The most common error was to omit the units when quoting data. The best responses described all the trends in the data.

(iv)   Most candidates provided a suitable response for this question. Some did not use their calculated value for **1(c)(i)** as instructed and so could not calculate the correct value.

(d)(i)   The majority of candidates were able to recall the test for reducing sugars. A common error was to omit the heating step from the procedure. A few responses described the test for starch.

(ii)   Most candidates were able to identify a suitable hazard and precaution.

Question 2

(a)(i)   The best responses had clear outlines with no shading or jagged lines. It was important that the drawing was an accurate representation of the algae, showing eight individual alga with a circle in the centre where the individuals join. Less successful responses had ruled lines which did not accurately represent the image.

(ii)   Most candidates were able to correctly measure the length of the algae in either cm or mm. The most common error was not dividing the length of the algae by the magnification.

(b)(i)   Some found this question challenging. A common error was to describe the different colours that hydrogencarbonate indicator would be at different light intensities rather than a method and variables to be measured and controlled. Better responses gave a suitable light intensity range with a method that described how this could be achieved.

(ii)   Candidates responded with a wide range of acceptable indicators. Less precise responses referred to 'pH paper', rather than Universal Indicator Paper or Litmus Paper which was not accepted.

BIOLOGY

> **Paper 0610/53**
> **Practical Test**

Key messages

- It is essential that candidates take time to ensure that their written work is legible. This includes the avoidance of 'overwriting' when mistakes are made or even writing in pencil and then overwriting in pen. When mistakes are made, they should be crossed out completely and the alternative answer written in a suitable clear space.

- 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 must be familiar with the practical procedures listed in 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 that derive from learned methods.

- When asked about safety considerations, candidates should identify a risk, but also identify a method of reducing that risk.

- 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

Candidates performed well on the majority of the paper, showing advanced preparation and familiarisation with the type of questions asked. It was evident that an increasing number of candidates show an understanding of the expectations of the assessment.

Some candidates continue to find the planning exercises challenging, but the majority were able to produce well thought-out, logical investigations. Identification of variables, safety and a workable method are key aspects of this task.

Graph drawing is a skill that most candidates continue to perform well on, with well-produced graphs. Similarly, producing a table for the data also posed few problems for the majority of candidates, with underlined headings and units.

The drawing skill remains challenging for a number of candidates. The instructions should be read carefully and drawings should be neat, in proportion and show sufficient detail.

Comments on specific questions

Question 1

(a) (i) A surprising number of candidates found this simple calculation very challenging. A simple proportional dilution was expected but many used the wrong numbers when performing the calculation. The table of data provided shows a logical progression in the values this shows that the value of the salt concentration in test-tube 2 is half of that in test-tube 3, so the concentration of salt for the calculated value should have been half as well.

(ii) Space was provided for a table of results to be constructed. Most candidates did this reasonably well. Common errors in table construction included:

- the use of incorrect headings. The top of each column of data should have an appropriate heading. Many included units within the body of the table instead of just in the heading. Percentage concentration of salt was an acceptable heading but mol/dm^3 was incorrect in this context.
- Not all candidates recorded the four repeat measurements, and some did not calculate an average for the repeats.
- A few candidates presented their results simply as a list of numbers and did not produce a table. A table should be drawn, preferably using ruled lines, with headings and units along the top of the table. Some placed the headings down one side of the table, which if clear, was accepted.

(b) Most candidates easily identified the use of a sharp knife was a hazard. Fewer were able to give a suitable precaution. The use of gloves alone was insufficient as standard plastic gloves would not protect against cuts. Ideas of cutting on a stable surface or alternative methods of holding the stem were credited.

(c) This was generally well-answered. Some gave imprecise responses that simply said that repeats would make the procedure more accurate, reliable or precise. A few candidates identified that taking repeats would allow anomalous results to be identified and to compare repeated values with one another.

(d)(i) Surprisingly few candidates could identify the concentration of salt as the independent variable in this investigation. Many stated that the volume of water or salt was changed but did not see that it was the final concentration of salt that was important (both the water and the salt volume could change with no change in concentration). The use of the terms volume or concentration is preferable to the more general amount, as in some contexts this can be too ambiguous.

Some were unsure of the difference the difference between the variable that is measured (the dependent variable) and the variable that is changed (the independent variable).

(ii) Most candidates could easily identify two variables that stayed the same, with the most common answers being the length of the cut stem and the type of tissue being used.

(e) Most candidates could identify the error in step 8 of the procedure, stating that there was difficulty in measuring the distance of 2mm. Any suitable method for improving this, such as marking the stem before cutting, was accepted. Similarly, candidates could easily identify that it was difficult to measure the distance between the cut ends of the stem, which were sometimes less than a millimetre apart.

(f) Most candidates were able to calculate the actual length of the line on Fig. 1.4, although a few could not rearrange the equation correctly or gave the wrong units.

Question 2

(a) Although asked to draw one of the hindwings of the butterfly, some drew the entire specimen, wasting valuable time and making their hindwing drawing too small.

Most drawings were drawn to a good size with an appropriate level of detail and suitable shape. Unfortunately many had shaded their drawings which not accepted. The use of a sharp pencil would improve the quality of the lines drawn in many cases.

(b) Generally candidates found this question straightforward, but many used language that lacked precision. Some stated, for example, that the pattern on the wings was similar or that the pattern was different but did not go onto say how it was similar or different. The best responses described exactly how the pattern, size or shape of the wings were similar or different. A common error was to describe features of the head or body of the butterfly rather than the wings.

(c) (i)   The graph was plotted quiet well with most candidates placing the points accurately. The axes were nearly always correctly labelled but the scale sometimes posed a problem. Good examples of scales either started at zero or the first value given. The scale chosen should ensure that more than half of the graph grid is being used to plot the points.

(ii)   This was very well-answered with only a few imprecise responses seen that did not describe any relationship. Candidates can use the terms directly or indirectly proportional but they should then also go on to describe what this means.

(iii)   Most candidates were able to estimate the body mass, but those who had chosen an inappropriate scale for their graph axes found it difficult to do this accurately. Some did not mark the graph to show how the estimate was achieved.

(d)   The planning exercise was a very simple application of food tests to find out which substances were present in nectar. Despite this, a large number seemed to get confused by the reference to molecules and did not describe the standard food tests at all, using microscopes to see the molecules instead. Even with no food tests, candidates were able to access some marks for experimental procedures such as the extraction of the nectar or for carrying out repeats to confirm results. Those who did describe the food tests scored highly for a completed plan.

BIOLOGY

Paper 0610/61
Alternative to Practical

Key messages

There were many excellent scripts where the answers were accurate, informed, clearly reasoned and well presented.

General comments

Candidates must read a question carefully before starting to write their answer. They must also follow the instructions precisely. Credit cannot be given for correct biology that is irrelevant to the answer required. It would be helpful for the candidates to look at both the mark allowance for an answer and at the space provided for it. Often only one piece of information is provided in an answer when there are two marks available. Similarly, if one line is provided and only one mark is available, it is inappropriate to write a paragraph.

When drawing a diagram, a soft pencil should be used and an eraser if necessary. 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 help candidates to choose an easy scale. 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. Candidates need more practice in constructing a table where there is an over-arching heading with sub-headings beneath, as was required in this paper.

When planning an investigation it is good practice to repeat the measurements of each value in the range chosen for the independent variable at least twice (i.e. three or more measurements in total for each independent variable value). If measurements are only taken twice and the results are different, then it is not possible to know which result is the true value one.

Comments on specific questions

Question 1

(a)   Almost all candidates could draw a table with at least three columns with a line separating the headings from the data. Many candidates also entered the data correctly. Stating the correct headings for the table proved to be more challenging. Some thought that the results referred to the length of the clotting process, rather than the state of clotting that had been reached after a period.

(b)   Most candidates were able to state a reasonable conclusion for the results provided. The best responses made the connection between the pH of the test-tube contents and the amount of clotting produced. A common mistake was to state that clotting occurred more slowly in alkaline conditions, a fact that could not be determined from the results given.

(c) (i) The reason for keeping the separate test-tubes at 40°C for three minutes before mixing the content was not widely appreciated. Many thought that the reason was to provide optimum conditions for enzyme activity, whereas the over-riding reason was to ensure that all the reactants were at the same temperature prior to being mixed.

(ii) This was well-answered, with most candidates being able to state two factors that were kept constant during the investigation. Some gave answers that were imprecise: for example, 'time' needs to be qualified by stating the time for which part of the investigation and 'volume' needs to be qualified by the name of the chemical.

(d) This proved to be a challenging question for some candidates. They were asked to identify four sources of error in the investigation and some responses instead stated improvements to the method or listed human errors such as not carrying out the stated method correctly.

(e) A significant proportion of candidates identified the use of an acid or an alkali as a hazard.

(f) The majority of candidates could name the biuret test as a test for the presence of proteins and knew the required colour change. Common errors included heating the reagents or performing the Benedict's test for reducing sugars.

(g) Many candidates correctly identified the test for fats as the ethanol emulsion test.

(h) There were some excellent descriptions given for testing the hypothesis stated in the question. Less detailed responses wrote about enzymes in general which did not meet all the criteria required. Others gained marks for general points such as repeating (the investigation) at least twice and wearing safety equipment such as goggles. Apart from these, the most frequently awarded marks were for using a thermostatically controlled water-bath, using the same volumes of reactants and keeping the pH the same.

Question 2

(a) (i) Almost all candidates performed this task accurately.

(ii) The average number of spiders per web was calculated correctly by nearly all candidates.

(iii) The calculation of the average number of insects in the whole garden was carried out correctly by the many candidates. A common error was to carry out a division instead of a multiplication.

(iv) Some candidates this question challenging. The majority referred (incorrectly) to differences in web size, or the fact that the figures used were averages. Many candidates did not appear to appreciate the nature of an average. Relatively few identified the fact that the sample size was too small or that environments could vary within the garden.

(b) (i) Some candidates produced an excellent drawing of the spider. Most drawings had clear unbroken outline which were of an appropriate size. Less well executed drawings divided the body into three sections with legs that did not give any indication of having joints. Those who labelled the abdomen usually labelled it correctly, but many omitted this step.

(ii) The measurement and calculation of magnification were usually carried out accurately. The most common errors were not inserting the measurement line on their drawing and stating the magnification with a unit.

(c) (i) Candidates were given information which they had to represent in a bar chart. Many were awarded full marks for this. The most common errors were not labelling the axes and drawing a histogram (with no space between the bars) instead of a bar chart.

(ii) A minority of candidates did not seem to recognise the term 'ratio'. Most performed the calculation correctly but a significant number wrote down the ratio of plants to animals instead of what had been requested: animals to plants.

BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

Many candidates were well-prepared for this exam and there were a lot of very good scripts which demonstrated good experience of the practical procedures outlined in the syllabus. Some need more practise in planning an investigation, drawing trend lines on graphs and identifying experimental errors.

Candidates should use a sharp pencil for drawings and graphs.

General comments

Most candidates were well prepared for the exam and answered the questions confidently.

Comments on specific questions

Question 1

(a) (i) The majority of candidates drew a table with ruled lines and the appropriate number of columns. Most responses also included headings with units and data within the data cells.

A common error was to include units in the data cells. Less frequently seen errors included omitting the header for the independent variable or writing the header in the data cells.

Most correctly put the data into the table to show the number of bubbles at each temperature. A few reversed their answers. Some included a column for the tally score and a few did not convert the tally to actual numbers.

(ii) Nearly all candidates gave a correct response to this question.

(b) (i) Many candidates gave a suitable conclusion. The most common error was to give a response that was not comparative. For example; referring to the yeast in the warm water-bath producing lots of bubbles but not going on to compare it to the yeast in the cool water-bath.

A less frequent error was to refer to the temperature drop between the starting and final temperatures.

(ii) Most candidates gave a correct explanation for why counting bubbles is not an accurate method of measurement. Describing an improvement proved more challenging. Some discussed using correct apparatus, such as a gas syringe, but did not explain that this would be used to measure the volume of gas produced. Others realised that the volume of gas should be measured, but did not say how it would be measured. Some incorrectly said that repeating the investigation would be an improvement.

(iii) Candidates found it challenging to identify the variable that should have been kept constant but was not kept constant. Good responses had considered all the information that was provided.

Many did identify that the temperature of each water-bath should have been kept constant. Many other variables were given, the most common being volumes or concentrations of yeast and glucose.

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Few were able to correctly describe a way of keeping the temperature in each water-bath constant, such as the use of a thermostatically controlled water-bath. Many thought that use of a thermometer was sufficient.

(iv) Most candidates were able to identify the independent variable; fewer were able to identify the dependent variable. A common error was to state volume instead of the number of bubbles.

(c) (i) The majority of candidates were able to calculate the average volumes of carbon dioxide produced in five minutes and one minute.

(ii) Most candidates were able to plot the graph accurately. Fewer were able to add a suitable trend line. Many did not realise that a line of best fit can be a curve. It was pleasing to see very few sketchy or thick lines.

The best responses selected a sensible scale for the axes which helped them to plot the points accurately. A few chose scales that went up in threes which made plotting the points more difficult. Omitting the units was the commonest error for the axes marking point. Overall plotting was done very accurately with the use of either small crosses or dots.

(iii) Most candidates recognised that as the concentration of glucose increased the rate of carbon dioxide production increased. A common error was to omit the units when quoting data. Descriptions of the plateau in the results were not always worded clearly enough to gain credit. Responses sometimes termed the plateau as the rate itself, rather than the increase in rate, stopping.

(iv) Many found this question challenging. Good responses made use of the graph when calculating the correct value. A common error was to try to calculate a value without using the graph.

(d) (i) The majority of candidates knew the test for reducing sugars. The main errors were to either omit the heating step entirely or to simply state that a water-bath was used without further detail of what it would be used for, which was insufficient.

(ii) The hazard and precaution were often identified correctly. One error seen was to state that Benedict's reagent is flammable. Most identified the hazard caused by heating. But some did not describe the hazard adequately and described problems with Bunsen burners with no mention of the risk of hot water or of heating.

Question 2

(a) (i)   Drawings of the algae were generally good. The most common errors were drawing the algae too large, so that part of it covered the text either above or below the space. Few drew it too small. Some did not draw the correct number of alga and some omitted the central circle. A common error was to use ruled lines to draw the algae. Ruled lines are rarely appropriate in biological drawings. It was pleasing to see that very few responses had sketchy or jagged lines or shading.

   (ii)   Measurements were usually correct as were calculations.

(b) (i)   Candidates who were familiar with this investigation did well on this question and some excellent answers were seen. Good responses described moving the light source further away from the algae in increments. Less precise but still acceptable responses simply described the use of varying light intensity with one set-up in the light and the other in the dark. Some responses incorrectly described the testing of leaves for starch and de-starched the algae at the start of the experiment. Some used leaves and tested them with iodine. Another common error was to describe the expected results more fully than the process of doing the experiment and obtaining the results. Some did not describe the use of the hydrogencarbonate indicator and counted bubbles instead. Descriptions of timescales were often imprecise. The use of a control with no algae was rarely given but should be considered when designing an investigation. Good responses also considered the controlled variables.

   (ii)   Most candidates provided a correct response to this question. A wide range of alternative pH indicators were given. The most common error was to suggest the use of a pH meter, or pH paper. Other incorrect answers seen were lemon juice and hydrogen peroxide.

BIOLOGY

> **Paper 0610/63**
> **Alternative to Practical**

Key messages

- It is essential that candidates take time to ensure that their written work is legible. This includes the avoidance of 'overwriting' when mistakes are made or even writing in pencil and then overwriting in pen. When mistakes are made, they should be crossed out completely and the alternative answer written in a suitable clear space.

- 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 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 that derive from learned methods.

- When asked about safety considerations, candidates should identify a risk, but also identify a method of reducing that risk.

- 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

Candidates performed well on the majority of the paper, showing advanced preparation and familiarisation with the type of questions asked. It was evident that an increasing number of candidates show an understanding of the expectations of the mark scheme.

Some candidates continue to find the planning exercises challenging, but the majority were able to produce well thought-out logical investigations. Identification of variables, safety and a workable method are key aspects of this task.

Graph drawing is a skill that most candidates continue to perform well on, with well-produced graphs. Similarly, producing a table for the data also posed few problems for the majority of candidates, with underlined headings and units.

The drawing skill remains challenging for a number of candidates. The instructions should be read carefully and drawings should be neat, in proportion and show sufficient detail.

Comments on specific questions

Question 1

(a)(i) A surprising number of candidates found this simple calculation very challenging. A simple proportional dilution was expected but many used the wrong numbers when performing the calculation. The table of data provided shows a logical progression in the values this shows that the value of the salt concentration in test-tube 2 is half of that in test-tube 3, so the concentration of salt for the calculated value should have been half as well.

(ii) Space was provided for a table of results to be constructed. Most candidates did this reasonably well. Common errors in table construction included:

- the use of incorrect headings. The top of each column of data should have an appropriate heading. Many included units within the body of the table instead of just in the heading. Percentage concentration of salt was an acceptable heading but mol/dm^3 was incorrect in this context.
- Not all candidates recorded the four repeat measurements, and some did not calculate an average for the repeats.
- A few candidates presented their results simply as a list of numbers and did not produce a table. A table should be drawn, preferably using ruled lines, with headings and units along the top of the table. Some placed the headings down one side of the table, which if clear, was accepted.

(iii) Some candidates found this quite challenging. Many described just one or two of the results rather than making a comment that summarised all of the results. Candidates can use terms such as inversely proportional but they must go on to describe what this means in terms of the results.

(b) Most candidates easily identified the use of a sharp knife was a hazard. Fewer were able to give a suitable precaution. The use of gloves alone was insufficient as standard plastic gloves would not protect against cuts. Ideas of cutting on a stable surface or alternative methods of holding the stem were credited.

(c) This was generally well-answered. Some gave imprecise responses that simply said that repeats would make the procedure more accurate, reliable or precise. A few candidates identified that taking repeats would allow anomalous results to be identified and to compare repeated values with one another.

(d)(i) Surprisingly few candidates could identify the concentration of salt as the independent variable in this investigation. Many stated that the volume of water or salt was changed but did not see that it was the final concentration of salt that was important (both the water and the salt volume could change with no change in concentration). The use of the terms volume or concentration is preferable to the more general amount, as in some contexts this can be too ambiguous.

Some were unsure of the difference the difference between the variable that is measured (the dependent variable) and the variable that is changed (the independent variable).

(ii) Most candidates could easily identify two variables that stayed the same, with the most common answers being the length of the cut stem and the type of tissue being used.

(e) Most candidates could identify the error in step 8 of the procedure, stating that there was difficulty in measuring the distance of 2 mm. Any suitable method for improving this, such as marking the stem before cutting, was accepted. Similarly, candidates could easily identify that it was difficult to measure the distance between the cut ends of the stem, which were sometimes less than a millimetre apart.

(f) Most candidates were able to calculate the actual length of the line on Fig. 1.5, although a few could not rearrange the equation correctly or gave the wrong units.

Question 2

(a) Although asked to draw one of the hindwings of the butterfly, some drew the entire specimen, wasting valuable time and making their hindwing drawing too small.

Most drawings were drawn to a good size with an appropriate level of detail and suitable shape. Unfortunately many had shaded their drawings which not accepted. The use of a sharp pencil would improve the quality of the lines drawn in many cases.

(b)   Generally candidates found this question straightforward, but many used language that lacked precision. Some stated, for example, that the pattern on the wings was similar or that the pattern was different but did not go onto say how it was similar or different. The best responses described exactly how the pattern, size or shape of the wings were similar or different. A common error was to describe features of the head or body of the butterfly rather than the wings.

(c) (i)   The graph was plotted quiet well with most candidates placing the points accurately. The axes were nearly always correctly labelled but the scale sometimes posed a problem. Good examples of scales either started at zero or the first value given. The scale chosen should ensure that more than half of the graph grid is being used to plot the points.

(ii)   This was very well-answered with only a few imprecise responses seen that did not describe any relationship. Candidates can use the terms directly or indirectly proportional but they should then also go on to describe what this means.

(iii)   Most candidates were able to estimate the body mass, but those who had chosen an inappropriate scale found it difficult to do this accurately. Some candidates did not mark on the graph show how the estimate was achieved.

(d)   The planning exercise was a very simple application of food tests to find out which substances were present in nectar. Despite this, a large number seemed to get confused by the reference to molecules and did not describe the standard food tests at all, using microscopes to see the molecules instead. Even with no food tests, candidates were able to access some marks for experimental procedures such as the extraction of the nectar or for carrying out repeats to confirm results. Those who did describe the food tests scored highly for a completed plan.