BIOLOGY

Paper 0610/11
Multiple Choice (Core)

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

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level. There was uncertainty about the level of organisation of a leaf; the identification of a sensory neurone in a reflex arc, and the direction along a concentration gradient that substances move during active transport. Calculating magnification was well-understood, as was the monohybrid cross and the fact that a zygote is produced when two gametes fuse.

Comments on specific questions

Question 1

While many candidates realised that the elimination of gas through the alveoli is an example of excretion, a minority believed this was an example of nutrition.

Question 2

Most candidates were familiar with the binomial system, with a minority being uncertain about which way round the genus and species are written in the binomial system.

Question 3

The majority of candidates gave the correct response.

Questions 4

While the majority of candidates appreciated that the cell membrane controls movement of substances into and out of a cell, some incorrectly opted for the cell wall.

Question 5

This proved to be a challenging question with many not appreciating that a leaf is an organ.

Question 7

Although many candidates appreciated that diffusion is involved in the movement of carbon dioxide and oxygen into and out of a mesophyll cell, a similar number opted for one of the incorrect distractors.

Question 8

While many candidates responded correctly, the commonest error was to select ‘particles move from a higher to a lower concentration’ in active transport.

Question 9

Although this is fundamentally a food test question, the problem-solving element proved to be challenging for many, with only some opting for the correct answer.

Question 10

Many candidates correctly identified the correct answer but some found this challenging.

Question 11

Many candidates identified the correct answer.

Question 14

There was some uncertainty as to where lipase is produced in the alimentary canal.

Question 16

Many candidates were able to derive the correct answer, although some incorrectly concluded that the shoot with no leaves would lose more water.

Question 18

Although some candidates identified the correct answer, the majority opted for an incorrect distractor.

Question 19

Many candidates were able to work out how the curve changes after vigorous exercise, although a similar number did not appreciate that both the volume and the frequency of breathing increase.

Question 20

There seemed to be some uncertainty as to whether only lactic acid is produced during anaerobic respiration in mammals (correct) or whether both lactic acid and carbon dioxide are produced (incorrect).

Question 21

While many candidates opted for the correct answer, some incorrectly believed that the bladder excretes urea and that the kidneys store urine.

Question 22

Some candidates were able to identify the sensory neurone in a reflex arc.

Question 23

There was some uncertainty about which structure refracts light in the eye, with similar numbers of candidates opting for the cornea (correct answer) and the iris (incorrect answer). A slightly smaller number of candidates opted for the fovea.

Question 26

While many candidates appreciated that implantation occurs in the uterus, some incorrectly believed that the site of implantation is the oviduct. A few opted for the ovary or vagina.

Question 28

There was some uncertainty as to when a woman is most likely to become pregnant.

Question 29

While most candidates opted for the correct answer, some did not appreciate that egg cells only contain X chromosomes.

Question 30

This question proved to be challenging for some candidates. While fertilisation and meiosis are required to form genetically different varieties of apple, mitosis is also needed for growth.

Question 32

While many candidates appreciated that height shows normal distribution and is an example of continuous variation, many opted for a characteristic that shows discontinuous variation.

BIOLOGY

Paper 0610/12
Multiple Choice (Core)

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

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level. There was uncertainty about the level of organisation of a leaf; the identification of a sensory neurone in a reflex arc; that implantation occurs in the uterus and the site of fertilisation in a flower. Most candidates were able to recognise a root hair cell, understood what precautions could help to prevent the spread of AIDS, and that alcohol is broken down in the liver. The definition of inheritance was well-known, as was the determination of sex. What is involved in genetic engineering was also well-known.

Comments on specific questions

Question 1

Although this question was well-answered by the majority of candidates, some incorrectly believed that the release of energy from nutrient molecules within cells is nutrition.

Question 2

Many candidates appreciated that the rats are from the same genus. Although some incorrectly believed that the rats were from the same species.

Question 3

While some candidates correctly identified the arthropod as an arachnid, since it only has four pairs of legs, over half the cohort incorrectly opted for one of the other groups, in particular crustaceans.

Questions 5

This proved to be a challenging question with many not appreciating that a leaf is an organ.

Question 6

While many candidates were able to derive the correct answer, some divided the magnification by the image size of the nucleus.

Question 7

Although many candidates appreciated that diffusion is involved in the movement of carbon dioxide and oxygen into and out of a mesophyll cell, some opted for one of the incorrect distractors.

Question 8

While many candidates identified that the glass tube where the solution had moved up the most was the correct answer, some incorrectly opted for the glass tube where the solution had moved up the least.

Question 9

Although this is fundamentally a food test question, the problem-solving element proved to be challenging for many, with only some opting for the correct answer.

Question 10

Many candidates correctly identified the correct answer but some found this challenging.

Question 11

While some candidates appreciated that the test-tube that contains the photosynthesising plant will have a decrease in the carbon dioxide concentration, many opted for one of the distractors.

Question 12

Many candidates correctly identified the xylem, although some could not distinguish between the xylem and phloem.

Question 14

While many candidates appreciated that amino acids are produced by protease from the stomach, some candidates incorrectly believed that amino acids are produced by amylase from the salivary glands.

Question 15

Many candidates identified the correct answer.

Question 16

Many candidates were able to derive the correct answer, although some candidates incorrectly concluded that the shoot with no leaves would lose more water.

Question 17

While many candidates were able to derive the correct answer, some were unable to work out which blood vessels carry oxygenated blood.

Question 18

This question was well-answered by most candidates, although some believed that a disease-causing organism is the definition of a bacterium or virus.

Question 19

Many candidates were able to work out how the curve changes after vigorous exercise, although a similar number did not appreciate that both the volume and frequency of breathing increase.

Question 20

This was a well-answered question, although some candidates did not appreciate that getting rid of carbon dioxide is excretion.

Question 21

Many candidates appreciated that urine concentration would increase and that the volume of urine would decrease immediately after exercise.

Question 22

Some candidates were able to identify the sensory neurone in a reflex arc.

Question 23

Many candidates appreciated that the central nervous system consists of the brain and spinal cord, although a large majority of candidates incorrectly believed that it consists of the brain, spinal cord and peripheral nerves.

Question 24

This was a well-answered question with most candidates appreciating that alcohol is broken down in the liver, although some candidates incorrectly opted for the kidneys.

Question 25

Identifying the site of fertilisation in a flower proved challenging for most candidates.

Question 26

While many candidates correctly appreciated that implantation occurs in the uterus, some incorrectly believed that the site of implantation is the oviduct, ovary or the vagina.

Question 28

Some uncertainty existed as to when a woman is most likely to become pregnant.

Question 29

The majority of candidates gave the correct response to this question.

Question 31

This was a challenging question, with few selecting the correct response to this question. Similar numbers selected each option.

Question 32

This question was well-answered.

Question 35

Many candidates were able to identify the correct arrow. A common error was to select the arrow that shows carbon dioxide leaving the plants.

Question 39

Many candidates appreciated that increased flooding is a negative impact on the environment, caused by deforestation. Common incorrect responses were a ‘decrease in land for livestock production’ and ‘decreased levels of carbon dioxide in the air’.

BIOLOGY

Paper 0610/13
Multiple Choice (Core)

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

General comments

The exam paper provided both a balance of questions and challenge for candidates working at this level. The term species was well understood, as were the calculation of magnification and the structure of the leaf. There was also a good understanding of how the pupil responds to different light intensities. There was uncertainty about the level of organisation of a leaf and the identification of a sensory neurone in a reflex arc. There was also uncertainty about where implantation occurs and when a woman is most likely to get pregnant.

Comments on specific questions

Question 1

While many candidates appreciated that excretion occurs both in plants and in animal, some candidates incorrectly believed that transpiration occurs both in plants and animals.

Question 2

The majority of candidates gave the correct response to this question.

Questions 5

This proved to be a challenging question with many not appreciating that a leaf is an organ.

Question 7

Although many candidates appreciated that diffusion is involved in the movement of carbon dioxide and oxygen into and out of a mesophyll cell, some opted for one of the incorrect distractors.

Question 8

This question on osmosis proved challenging for many with few selecting the correct response.

Question 9

Although this is fundamentally a food test question, the problem-solving element proved to be challenging for many, with only some opting for the correct answer.

Question 11

While many candidates appreciated that the test-tube that contains the photosynthesising plant will have a decrease in the carbon dioxide concentration, a similar number of candidates opted for one of the distractors.

Question 14

This proved to be a challenging question, with most candidates not appreciating that since protease is found in the stomach (which contains acid), it will have a low pH.

Question 15

Many candidates responded well to this question but there was some uncertainty about which area represents the xylem and which area is the phloem.

Question 17

While many candidates were able to derive the correct answer, some were unable to work out which blood vessels carry oxygenated blood.

Question 18

Although many candidates appreciated that mucus can prevent some pathogens from entering the body, some incorrectly believed that antibody production can prevent pathogens from entering the body.

Question 19

Many candidates were able to work out how the curve changes after vigorous exercise, although some did not appreciate that both the volume and the frequency of breathing increase.

Question 22

Some candidates were able to identify the sensory neurone in a reflex arc.

Question 26

While many candidates correctly appreciated that implantation occurs in the uterus, some incorrectly believed that the site of implantation is the oviduct, ovary or the vagina.

Question 28

Some uncertainty existed here as to when a woman is most likely to become pregnant.

Question 30

While many candidates appreciated that egg cells are produced by meiosis, some incorrectly believed that white blood cells are produced by meiosis.

Question 31

This was a challenging question, with few selecting the correct response. Similar numbers selected each option.

Questions 34 and 35

The majority of candidates gave correct responses for these questions.

Question 37

Many candidates appreciated the features that make bacteria useful in biotechnology.

Question 38

Many candidates responded correctly, although some candidates did not appreciate that lipase breaks down fat.

Question 39

Some candidates knew that a sewage treatment works is the least likely source of pollution but the majority selected one of the incorrect responses.

Question 40

Not all candidates were familiar with the role of seed banks.

BIOLOGY

Paper 0610/21
Multiple Choice (Extended)

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

General comments

The exam paper provided a good balance of questions and challenge for candidates working at this level. There was uncertainty about the level of organisation of a leaf and the products of anaerobic respiration in mammals. There was uncertainty about which part of the eye refracts light and the source of progesterone in pregnancy. Most candidates recognised the xylem as the site of water transport and knew the features of human male gametes and sexual reproduction. The inheritance questions were well-understood.

Comments on specific questions

Questions 1, 2, 15, 19, 26, 32, 33, 36 and 39

The majority candidates gave correct responses for these questions.

Question 3

While many candidates appreciated that the movement of substances into and out of a plant cell is controlled by the cell membrane, some incorrectly opted for the cell wall.

Question 4

This proved to be a challenging question with many not appreciating that a leaf is an organ.

Questions 5

This was generally well-answered. The commonest incorrect response was respiration.

Question 6

Many candidates responded correctly, although some incorrectly opted for the weakest concentration.

Question 7

Although this is fundamentally a food test question, the problem-solving element proved to be challenging for many, with only some opting for the correct answer.

Question 8

Although many candidates understood base pairing well, some selected the incorrect pair.

Question 10

This question was generally well-answered, although some candidates opted for a wrong distractor. Care needs to be taken when questions are read. The commonest incorrect responses were ‘shape’ instead of ‘active site’.

Question 14

Some candidates knew where lipase is secreted but many were uncertain.

Question 16

Although this was a challenging question it was reasonably well-answered.

Question 18

While many candidates opted for the correct answer, some candidates incorrectly believed the valves worked the opposite way round, i.e. the atrioventricular valves opening and the semilunar valves closing.

Question 20

Although this question was generally well-answered, some candidates did not appear to appreciate that both the volume and the frequency of breathing increase.

Question 21

Some recalled that only lactic acid is produced but many thought that carbon dioxide is also produced.

Question 23

There was some uncertainty about which structure of the eye refracts light.

Question 24

Many candidates were able to correctly identify which statement explains the results, but many found this challenging.

Question 25

Many did not realise that since the person has been exercising and hence using more glucose, the starting point in the answer must be 5 (more glucagon).

Question 29

Most candidates were not aware that in pregnancy, once the placenta is established, it produces most of the progesterone.

Question 31

Although most candidates recognised stage X as the duplication of chromosomes, fewer then selected mitosis as process Y.

Question 34

Most candidates appreciated that antibiotic resistance is caused by natural selection. The commonest incorrect response was artificial selection.

Question 35

Some candidates showed a good understanding of the nitrogen cycle but many were less secure of when each process occurred.

BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

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

General comments

The exam paper provided a good balance of questions and challenge for candidates working at this level. Many topics were well-understood by the majority of candidates. Some topics that proved more challenging. These included; the definition of respiration, the characteristics of Fungi and Protoctists, eutrophication and the level of organisation of a leaf.

Comments on specific questions

Question 1

Although this was generally a well answered question, some incorrectly believed that the detection of a change in blood temperature is called respiration.

Question 2

This proved to be quite a challenging question with many opting for an incorrect answer. The features of Fungi and Protoctists were not well-known by all.

Questions 3, 5, 10, 13, 14, 15, 22, 26, 29, 30, 33, 34 and 35

The majority of candidates gave correct responses to these questions.

Question 4

Many candidates knew that a leaf is an organ. The commonest incorrect responses were 'tissue' or 'cell.'

Question 7

Although this is fundamentally a food test question, the problem-solving element proved to be challenging for some.

Question 11

Although this was a well answered question with many candidates appreciating that the test-tube that contains the photosynthesising plant will have a decrease in carbon dioxide concentration, some opted for one of the distractors.

Question 12

Many candidates correctly identified the cells as epidermal cells. Some incorrectly believed these to be palisade cells. This option should have been eliminated by the fact that there were no chloroplasts present.

Question 16

Although this was a challenging question it was reasonably well-answered.

Question 18

Many candidates identified the correct answer. Some incorrectly believed that the valves worked the opposite way round, i.e. the atrioventricular valves opening and the semilunar valves closing.

Question 20

Although this question was well answered, some candidates did not seem to appreciate that both the volume and the frequency of breathing increase.

Question 21

This was a well answered question, although some candidates did not appreciate that getting rid of carbon dioxide is excretion.

Question 23

Many candidates appreciated that the central nervous system consists of the brain and the spinal cord, although some incorrectly believed that it consists of the brain, the spinal and peripheral nerves.

Question 24

Many candidates were able to correctly identify which statement explains the results, but many found this challenging.

Question 27

While this question was well answered, some opted for incorrect distractors. Some candidates incorrectly believed that sperm cells have a jelly coat present.

Question 31

This question was well answered. Although some did not appreciate that mitosis results in the same number of chromosomes in the daughter cells as the parent cell.

Question 32

Many candidates gave the correct response, although some did not seem to appreciate that co-dominance is involved in this question.

Question 36

Although many candidates gave the correct response, many could not identify denitrification on the nitrogen cycle diagram.

Question 37

Many candidates correctly identified the role of the rotating blades in a fermenter.

Question 39

Similar numbers of candidates opted for a correct answer and an incorrect distractor. Some candidates did not appreciate that it is the increase in organic matter from the death of producers that causes an increase in bacteria.

BIOLOGY

Paper 0610/23
Multiple Choice (Extended)

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

General comments

The exam paper provided a good balance of questions and some challenge for candidates working at this level. Although a number of items proved to be well known for many candidates, there were some topics that proved to be more challenging. These included; the level of organisation of a leaf, the processes that depend on water being a solvent, sinks and sources in plants and why insulin from bacteria is regarded as a better ethical choice.

Comments on specific questions

Questions 1, 3, 5, 7, 9, 10, 11, 13, 15, 17, 19, 21, 22, 23, 26, 27, 29, 30, 32, 33 and 36

The majority of candidates gave correct responses for these questions.

Question 4

Many candidates knew that a leaf is an organ. The commonest incorrect responses were 'tissue' or 'cell.'

Question 6

Many candidates correctly identified active transport as the process involved in the uptake of glucose by the epithelial cells of kidney tubules. The commonest incorrect response was diffusion.

Questions 8

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

Question 14

While many candidates gave the correct response, some did not appreciate that the protease found in the stomach will work best at a low pH.

Question 16

Although this was a challenging question it was reasonably well-answered.

Question 18

Many candidates identified the correct answer. Some incorrectly believed that the valves worked the opposite way round, i.e. the atrioventricular valves opening and the semilunar valves closing.

Question 24

Many candidates were able to correctly identify which statement explains the results, but many found this challenging.

Question 28

Many candidates were able to correctly work out when ovulation and fertilisation could occur. Some believed that fertilisation could occur at point S, but this is 12 days after ovulation when a viable ovum is unlikely to be present.

Question 31

Many candidates gave the correct response but many found this challenging.

Question 35

Although this question was well answered, some incorrectly opted for a distractor that did not have two animals that are secondary **and** tertiary consumers.

Question 37

This proved to be a challenging question, with only some appreciating the reason why insulin from bacteria is regarded as a better ethical choice.

Question 38

Although many candidates appreciated that the plasmid is a loop of DNA, some incorrectly believed that it is a bacterial cell.

BIOLOGY

Paper 0610/31
Theory (Core)

Key messages

The best responses showed an understanding of the requirements of command words such as 'describe', 'explain', 'suggest' and 'compare'.

Candidates demonstrated good knowledge and were able to apply their knowledge of many topics, particularly enzymes (**Question 8**) but were less confident in their use of the terminology relating to genetics and the process of selective breeding (**Question 7**).

General comments

Candidates were well-prepared and demonstrated understanding of the most areas of the syllabus that were tested in this exam.

Where numbered lines are given; there should be only one response on each line.

Comments on Specific Questions

Question 1

(a) Most candidates correctly identified the ovary but fewer were able to recall the site of fertilisation or implantation.

(b) (i) Most candidates gave the correct response. Common errors included ovule, oviduct, uterus and vagina.

(ii) Most candidates gave the correct response.

(c) The majority of candidates were able to give correct responses for the growth of sex organs and pubic hair. Menstruation and voice deepening were less well known.

(d) Many correct responses were seen. The least well known cell was the ciliated cell.

Question 2

(a) Candidates generally did very well on this question. Responses showed that they had looked carefully at the data and many realised that without added carbon dioxide some photosynthesis would still take place as there would be a small volume of carbon dioxide available; either dissolved in the water or as a product of respiration.

(b) Some good responses were seen but some found this question challenging. A common error was to answer test 2 in the context of it being at 15 °C rather than at 25 °C. The best responses used precise terminology such as 'the rate of photosynthesis increases' rather than 'it gets better'.

(c) The majority of candidates gave the correct response. A common misconception was that a partially permeable membrane is required for diffusion. The commonest error was to select the wrong concentration gradient; i.e. movement from low to high.

Question 3

(a) (i) and (ii) Candidates answered these questions very well and it was rare to see an incorrect response.

(iii) This proved to be a challenging question with only a few were able to correctly calculate a percentage increase. The majority were able to correctly round their answer to a whole number.

(b) The commonest correct response was ECG. A significant number described taking the pulse rate which did not answer the question.

(c) Most candidates identified that the breathing rate increases, fewer realised that it would also get deeper. A common error was to describe respiration rather than breathing.

(d) Many correctly identified the missing words. The commonest error was to give 'heart' for the first gap.

(e) (i) Only a few gave the correct response for this question. The commonest error was to give the equation for aerobic respiration.

(ii) Most candidates gave a correct response for this question.

Question 4

(a) Most candidates identified the canine and molar tooth names correctly. The majority also knew the correct positions of the teeth in the jaw. Fewer were able to correctly identify the functions of teeth. The commonest incorrect function given was 'grinding' for both the canines and incisors.

(b) (i) This proved challenging for some. Many wrote about eating candy and not brushing the teeth. Others just wrote about bacteria in the mouth but did not go on to explain the role of the bacteria in tooth decay. The best responses linked the role of bacteria to the process of tooth decay. Few realised that it was the bacteria that produced the acid.

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

Question 5

(a) Nearly all gave a correct response for this question.

(b) Generally answered well, although some responses lack sufficient detail.

(c) (i) Some correct responses were seen. Respiration was the commonest correct response. A common error was to give examples of where combustion occurs, e.g. 'cars'.

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

(d) Some candidates gave correct responses for this question. The best responses used precise terminology, e.g. 'enhanced greenhouse effect' rather than 'greenhouse effect'. The most common correct responses were global warming, climate change, ice melts, sea levels rise, loss of habitat and extinction of species. Many incorrect responses discussed photosynthesis and respiration.

(e) A good range of responses were seen for this question. Some were less sure of the differences between the roles of pesticides and herbicides.

Question 6

(a) (i) Generally well-answered. The commonest error was 'has four legs' this was not accepted as it is not a distinguishing feature of mammals.

(ii) Generally correct responses were given with 'leo' being the commonest incorrect response.

(b) The majority gave four correct responses for this question. The most common error was 'reptiles' for 'smooth moist skin'.

(c) Many candidates gave two correct features. The commonest error was to give the functions of cells rather than the features.

Question 7

(a) (i) Nearly all candidates gave the correct response.

(ii) Many gave the correct response. The commonest error was to give the genotype.

(iii) Few gave two correct terms. Common incorrect terms were 'white' and 'heterozygous'.

(b) This was a challenging question for many. The commonest errors were 'continuous' and 'heterozygous.

(c) Many completed the Punnett square correctly and some went on to give the correct ratio. The commonest source of error was incorrect gametes.

(d) Some responses showed a good understanding of selective breeding. Some responses discussed the genotype rather than the phenotype or repeated information from previous responses that either did not answer the question or was ambiguous. The best responses included the idea that breeding would need to occur over a number of generations.

Question 8

(a) (i) The majority of candidates gave the correct value. The commonest incorrect value was 35 ºC.

(ii) Most candidates gave the correct response to this question.

(b) Again this was well-known by the majority of candidates.

(c) Very well answered with nearly all drawing six correct lines.

BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

The majority of candidates showed a good understanding of many topics including the carbon cycle, farming and pollution. Some were less secure in their knowledge of inheritance and the process of tooth decay.

General comments

There were some excellent papers produced which showed a good knowledge and understanding of many areas of the syllabus.

Comments on specific questions

Question 1

The majority of candidates gave the correct response.

Question 2

(a) (i) Most candidates provided a correct response for dish **B**. Fewer gave the correct response for dish **A**. The main misconception was that light was necessary for germination to occur.

(ii) Many candidates appreciated that the seeds would germinate as they had both water and a suitable temperature, but that growth after germination would be severely limited as the germinated seeds would be unable to photosynthesise.

(b) (i) It was pleasing to see that most candidates were able to calculate the correct percentage. Fewer gave their answer as a whole number as instructed.

(ii) This was well-answered by the majority of candidates. The most common correct responses made reference to a lack of resources, such as not enough water being present for the germination of all seeds.

Question 3

Many found this question challenging. Most knew that plants store glucose as starch and that cellulose is made of glucose but glycogen and the elements found in fats and proteins were not well-known.

Question 4

(a) Most candidates gave the correct positions of incisor and molar teeth.

(b) (i) Many candidates gave the correct response. The commonest error was to quote the number of decayed teeth rather than the number of teeth lost.

(ii) Nearly all candidates gave the correct value.

(iii) Most responses provided a plausible reason for the difference in the number of decayed teeth. A few responses did not make it clears as to whether they were referring to person **A** or to person **B**.

(iv) Almost all candidates correctly identified the molar teeth.

(c) Some candidates provided a correct response to this question but many found it challenging. The best responses made the link between bacteria respiring sugars to produce an acid which then dissolves the tooth enamel. The commonest misconception was that the bacteria directly destroy or 'eat' the enamel.

Question 5

(a) (i) The oesophagus and the pancreas were well-known.

(ii) Most candidates could identify the small intestine as the place where digested food is absorbed. Some correctly identified where faeces is stored but few could identify the small intestine as the site where most of the water absorbed. It was a common misconception that the colon absorbs the most water. The colon absorbs some water to produce semi-solid faeces, whereas the small intestine is constantly secreting and absorbing water.

(b) (i) Some candidates gave the correct response. Common incorrect responses were absorption, digestion and nutrition.

(ii) Few correct responses were seen and the term *egestion* does not seem to be widely known. The most common incorrect response was excretion.

(c) (i) Some candidates gave good detailed responses to this question. A common error was to describe the increase in the rate of reaction from pH 4.5 to pH 8.4 but then, instead of describing the subsequent decline in the reaction rate they gave a reason for the decline so that the description was incomplete. Some also stated that there was an optimum pH for the reaction but did not state what that value was. Few gave a data quote involving information from both axes.

(ii) This was well-answered by candidates.

Question 6

(a) (i) Most could identify the zygote.

(ii) Many candidates identified the correct process. Common errors included; meiosis, reproduction and implantation. 'Nuclear fusion' was accepted, but not 'fusion' unqualified.

(iii) A few responses correctly stated where fertilisation normally takes place. Common incorrect responses were the uterus and the vagina.

(b) (i) This proved to be a challenging question for many. Common errors seen were the use of sex chromosomes rather than the given alleles **T** and **t**, many seemed unfamiliar with the term *genotype.*

(ii) Many candidates identified the correct ratio but fewer were able to accurately state all the possible offspring genotypes.

Question 7

(a) Some responses showed a good recall of the definition of transpiration. The commonest correct words were 'leaves' and 'stomata'. The least well-known was how water vapour moves out of the plant, with many incorrectly stating that it moves by osmosis.

(b) There were some excellent responses to this question. One error was to select an environmental condition but then to describe the effect of an increase rather than a decrease.

Question 8

(a) (i) Most candidates gave the correct function.

(ii) Many candidates were able to provide one adaption, fewer could accurately describe two. Many knew that red blood cells do not possess a nucleus. Some described the shape of the cell correctly but some of the descriptions were unclear. A few referred to the presence of haemoglobin.

(b) Many candidates gave a correct response.

(c) (i) Some candidates identified the disease correctly.

(ii) The risk factors were well-known, but sometimes stated imprecisely. 'Poor diet' and 'exercise' alone were insufficient.

(d) Some responses identify all the blood vessels correctly.

(e) Many responses made correct reference to valves and their function in maintaining a one-way flow. Some responses gave a detailed account of the circulatory system instead of describing *how* a one-way flow was maintained.

Question 9

(a) Some responses gave a good description of the effects on the wider ecosystem. However, many only described the problems associated with intensive farming which did not answer the question.

(b) The reasons for using fertilisers and insecticides were well-known by the majority of candidates. A common misconception was that herbicides are used to kill herbivores.

(c) Most candidates could state two sources of water pollution. A common error was to refer to fertilisers and insecticides which did not answer the question.

BIOLOGY

Paper 0610/33
Theory (Core)

Key messages

The responses to descriptive questions were generally excellent, with candidates making clear concise points.

General comments

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

Comments on specific questions

Question 1

(a) Most candidates recognised that arthropods have a number of pairs of jointed legs.

(b) (i) Most gave the correct response to this question.

(ii) Candidates correctly identified the organism and some candidates were able to give a feature that is specific to crustaceans.

(c) (i) and (ii) The organism was correctly identified by nearly all candidates and most were also able to give the correct group name.

Question 2

(a) and (b) There was an excellent understanding shown of the organisation within the organ in these two questions. The commonest error was to put *organ system* and *organ* in the wrong order.

Question 3

(a) (i) Most candidates gave a correct response.

(ii) Although candidates understood its position in the food chain, many were unclear about the role of the producer.

(iii) and (iv) Most candidates answered both questions correctly.

(v) This question was generally answered in term of who eats whom, rather than energy transfer.

(b) There were many excellent answers demonstrating a good understanding of the relationships in a food chain.

Question 4

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

(ii) There were some very good answers, but some responses gave the *cause* of no habitat rather than the *effect* of its destruction.

(b) This question was generally well answered. A common error was to give reasons for disruption of the food web rather than destruction of the habitat itself.

(c) Most candidates were able to describe at least one method of conservation, while many gave a number of methods.

(d) This proved to be a challenging question for some. The best responses ensured that the answers in each cell matched the heading and the other columns.

Question 5

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

(b) Most responses did not recognise that breeds of horses all belong to the same species (this information was in the question stem), so did not recall the word for differences within species.

(c) There were very good attempts to describe the process of selective breeding, with many candidates correctly suggesting the selection of traits. Fewer went on to suggest selecting offspring or repeating over many generations.

(d) While some responses successfully compared natural selection with selective breeding, most were not comparative and just described animals 'selecting their own partners' or the process of artificial insemination.

Question 6

(a) (i) and (ii) Many candidates gave the correct responses to these questions.

(b) (i) Although most candidates could define the function of an enzyme, few identified it as a protein.

(ii) Generally well answered.

(iii) and (iv) Many candidates read the correct values from the graph, to work out the increase in reaction rate and then the optimum temperature. One error was to read the *y*-axis instead of the *x*-*axis*.

(c) Most candidates gave the correct response.

(d) Many responses gave a good explanation of the use of pectinase.

(e) There were many excellent answers to this question, showing that candidates had a good understanding of food hygiene.

Question 7

(a) (i) Excellent responses were seen for this question.

(ii) Most candidates answered correctly. A common error was to give the name of the blood cell instead of what the cell does.

(b) (i) Generally well answered.

(ii) While most candidates understood that antibiotics do not work against HIV, fewer could clearly explain why.

(iii) There were many excellent responses on controlling the spread of STIs. One misconception was that the contraceptive pill would protect against STIs.

Question 8

(a) (i) This question was generally well answered, with most candidates getting the letter of the part correct, but not always matching the name. A common misconception was that urea is produced in the kidney.

(ii) Many were unclear as to whether egestion occurs in the anus or the rectum.

(iii) A few responses indicated that hydrochloric acid kills bacteria. The commonest error was that it digests food.

(b) This question was well answered by many candidates. The commonest errors were using the words ureter, uterus for urethra and vice versa.

BIOLOGY

Paper 0610/41
Theory (Extended)

Key messages

- Some questions require a description or an explanation. The best responses recognise the important points and link them together to give a clear logical account that differentiates between the command words describe and explain.
- Data quotes were often given in **Question 5(c)(ii)**. Good responses gave values that included units.
- Not all were able to recall the definitions of the key words that were required in **Questions 1(b)(i)** and **5(a)(i)**.
- For questions where a limited number of responses are required (e.g. State **one** type of...) only the first response will be considered.

General comments

Careful reading of the whole question including the stimulus material is important.

Comments on specific questions

Question 1

(a) (i) Almost all candidates knew the principal source of energy is the sun. A few suggested carbon dioxide. Other common incorrect responses were 'photosynthesis' and 'fossil fuels'.

(ii) Most knew that **C** on Fig. 1.1 represented the primary consumers. The most frequently seen incorrect answer was **A**.

(iii) Most knew that energy is transferred from producers to primary consumers through feeding.

(iv) Most responses stated that energy is lost between the trophic levels. Fewer gave examples of how the energy is lost. The most common reason given for loss of energy was respiration. Only a few related the loss of energy to excretion or to the fact that not all of the organism is eaten. A few responses did not refer to energy loss at all. Common errors were to say that there were more organisms or more biomass in level **B** than in level **A**, without reference to energy loss.

(b) (i) Very few responses gave a correct definition. Many stated decomposers feed on dead organisms but very few stated that they get energy from them.

(ii) Some candidates gave the correct response to this question.

(c) The majority of candidates knew that through combustion of fossil fuels, humans are increasing the concentration of carbon dioxide in the atmosphere. Many also described how deforestation means that there are fewer trees to absorb carbon dioxide. Fewer candidates related the increasing carbon dioxide concentrations to the enhanced greenhouse effect and global warming. Very few linked burning of trees to carbon dioxide release and cattle farming to increasing methane levels. Less confident response referred to 'pollution spreading' and descriptions of the ozone layer being destroyed which did not answer the question.

Question 2

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

(b) Most candidates gave a good description of the difference between the two Petri dishes as evidence that bacteria in dish **F** were resistant to penicillin. Fewer went on to relate resistance to the ability to survive or reproduce in the presence of the antibiotic.

(c) (i) The development of antibiotic resistance in bacteria was not well understood. The best responses gave an explanation which included reference to variation and natural selection. A common misconception was that antibiotics cause the mutation which creates antibiotic resistance. A few stated incorrectly that bacteria gained *active immunity* after exposure to antibiotics. Candidates were more confident about the steps that humans can take to reduce antibiotic resistance and many good responses were seen. Most stated that antibiotics should only be used when necessary, that people should always complete the course of antibiotics prescribed and that new antibiotics should be developed. Surprisingly few referred to improved hygiene and screening, which were also acceptable. The majority of candidates clearly understood the difference between antibiotics and antibodies which has not always been the case in the past.

(ii) This question was well-answered by the majority of candidates. Most responses referred to the fact that viruses are not alive, or that they lack a cell wall or a named organelle. Some wrote very detailed responses that explained how antibiotics act on bacterial cell walls and affect the cellular functions of bacteria. Some misconceptions included: viruses are too small for antibiotics to harm them and viruses do not have antigens.

(d) Many responses to this question were very good. Candidates commonly referred to the fast reproduction rate, presence of plasmids, ease of genetic modification, lack of ethical concerns and ability to synthesise useful products such as insulin. A common error was to refer to yeast as a bacterium, or to describe vaccine production using dead bacteria.

Question 3

(a) This question on the features of xylem vessels was answered quite well by most candidates. The majority stated that xylem vessels have no cytoplasm and contain lignin in their cell walls. Some stated that the walls of vessels are impermeable to water. Fewer mentioned the pits in the cell walls or the absence of end walls between the individual cells that make up a xylem vessel.

(b) The majority of candidates knew that water enters root hairs and were correctly able to identify root hair cells and cortex.

(c) (i) Many candidates calculated the correct percentage increase. One of the more common errors was to use the wrong denominator.

(ii) Some candidates quoted the correct data with units to support their answer, however a common error was to omit the units. The question required the candidates to provide the link between the narrow xylem in the question stem and the data on flow rates in the different zones in the table. This proved to be challenging for some.

(iii) This question was also challenging for many. The best responses stated that a toxin would have no effect on xylem vessels because they are made of dead cells.

Question 4

(a) Many responses could identify some of the parts of the eye but only a minority completed all five correctly. A common error was to identify the iris as detecting light and colour. A common error was to identify the ciliary muscle as the ‘cilia muscle’.

(b) (i) Some candidates knew that antagonistic was the term used to describe the action of a pair of muscles working in opposition. The most common incorrect answer was ‘contrary muscles’. Frequently ‘opposing muscles’ was seen but this was in the question stem.

(ii) Almost all candidates named the process that allows the eye to view objects at different distances. The most common answer was focusing.

(c) Many candidates knew the function of the cone cells. Good responses referred to cone cells not working in low light intensity.

(d) (i) The majority of candidates identified the correct genotype.

(ii) Most candidates identified the genotype of a colour-blind male as X^bY. The most common misconception was that a colour-blind male has the genotype X^bY^b,

(iii) Most candidates drew a symbol on Fig. 4.2. The most common incorrect answers included either a carrier female or a carrier male symbol.

(iv) Many found this question challenging. Most recognised that the colour blindness came from the father but did not support this with a creditable explanation. Good responses identified that females **4** and **5** were heterozygous or gave the genotype as X^BX^b.

Question 5

(a) (i) Many candidates defined the term hormone, but many responses gave examples rather than a definition. Many answers mentioned that a hormone is carried in the bloodstream to a target organ, but did not indicate that it has an effect on that organ's activity.

(ii) There were some excellent explanations of how the liver responds to an increase in insulin concentration. Quite a few responses confused glucagon with glycogen.

(b) (i) Many candidates gave good descriptions of deamination. A common error was to give a description of protein digestion.

(ii) Some candidates correctly identified the process. The commonest incorrect response was assimilation.

(c) (i) Good responses described the aerobic respiration of lactic acid after exercise has finished. The commonest incorrect responses described the formation of lactic acid.

(ii) Many responses described the relationship between alcohol consumption and the risk of dying from liver disease, but fewer stated the similarity between the trends for males and females. Often the increase shown on the graph in both males and females was unqualified. Better responses stated that the risk increases in both sexes, but the increase in males is exponential whereas it is not in females. The majority gave comparative data quotes, but many did not include the correct units in their response. Most referred to females having a higher risk of liver disease at low alcohol consumption, but many read the wrong values off the graph in support of their answer. A few candidates noticed that males and females had the same risk of liver disease at a consumption of 112 g per day of alcohol.

Question 6

(a) (i) The majority of candidates gave the correct response. The most frequent incorrect responses were instinct and automatic.

(ii) Many candidates correctly described the advantages of breast-feeding. The best responses covered the majority of the marking points. The most common correct responses included: passive immunity, bonding with the mother, being always available, being free or cheap and that the composition of breast milk changes with the development of the child. Some responses incorrectly gave disadvantages.

(b) (i) The effects of high temperatures on enzymes was well understood by the majority of candidates. Fewer described the effects of low temperatures on enzymes. Some responses lacked sufficient detail and did not qualify the statements about temperature with the effect that it would have on the enzymes.

(ii) Most responses gave at least one correct substrate and product for Table 6.1. Protease was the most well-known enzyme. A minority of responses gave the substrate in the product column and vice versa. A common error was to give a broad group for the substrate or product such as carbohydrate rather than starch.

(iii) The majority of candidates identified pH as another condition that must be controlled to optimise enzyme activity.

BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

- Some questions require a description or an explanation. The best responses recognise the important points and link them together to give a clear logical account that differentiates between the command words describe and explain.
- The use of a ruler when extracting data from graphs will ensure accuracy. It was apparent that some of the lines drawn on Fig. 4.1 in response to **Questions 4(b)(i)** and **(iii)** were not straight making accurate data quotations difficult.
- For questions where a limited number of responses are required (e.g. State **one** type of...) only the first response will be considered.
- Mathematical skills are often tested in these papers. Only some candidates were able to calculate a percentage change correctly in **Question 4(b)(ii)**.
- The differences between sexual and asexual reproduction in plants was not well-understood by all. A common misconception was self-fertilisation is a type of asexual reproduction.

General comments

In general, candidates have followed the advice given in previous reports and indicated where their continuation and rewritten answers were given on the scripts.

Many *described* the results from Fig. 4.1 in **Question 4(b)(iv)**, rather than *explaining* the response shown by person **B**. In **Question 4(b)(iii)** some did not use comparative statements only simple descriptive ones without any appropriate words, such as 'higher' and 'lower' or 'steeper' and 'less steep'.

Comments on specific questions

Question 1

(a) Many candidates completed Table 1.1 correctly. Common errors were to name the snow goose, pipe fish and water flea as secondary consumers. The snow goose was also identified incorrectly as an animal that feeds at two trophic levels. The muskrat was not a correct answer anywhere in the table, but was given by some candidates for the second and/or third rows.

(b) Various processes in the nitrogen cycle were given to identify **A** on Fig. 1.2: ammonification, denitrification and nitrogen fixation were the closest to nitrification, which was the correct answer. Many identified bacteria as the type of organism that converts ammonium ions to nitrate ions. Some correctly identified these as nitrifying bacteria. Some qualified the bacteria with the name of the incorrect process given as the answer to the process.

(c) There were many good descriptions of the active uptake of nitrate ions by root hair cells. Many of these answers were very detailed giving all the points on the mark scheme. There was some confusion about osmosis as candidates stated that minerals are dissolved in soil water which moves into root hair cells by osmosis. Some stated incorrectly that nitrate ions move 'from a high water potential to a low water potential'. Some decided that this was a question about nitrogen fixation and described the uptake of nitrogen gas (dinitrogen) into root nodules and the production of ammonia.

(d) Few responses stated that ribosomes are the site of protein synthesis (process **D** in Fig. 1.2). Common errors were cytoplasm, xylem, phloem, root nodules and leaves.

(e) Nitrogen fixation was given as process **B** by some candidates, but many gave other stages in the nitrogen cycle or processes in other cycles such as respiration or combustion.

(f) Some responses made the key point that energy is lost between trophic levels. However this concept was not well-known. Some were able to give examples of reasons for the energy loss, the most common being that not all parts of the organisms are eaten or digested. Many referred to 'food' or 'numbers' being lost, rather than energy. The majority provided a description of the appearance of a pyramid of numbers rather than an explanation which did not answer the question.

Question 2

(a) There were many good definitions of the term *allele*. Common errors were definitions of genes or to state that an allele is part of a gene. Some referred to alleles being dominant and recessive rather than answering the question.

(b) There were many excellent explanations of how a mutation in DNA results in an abnormal enzyme which does not catalyse the reaction shown in Fig. 2.2. The best responses began by stating that the mutation changes the sequence of bases in the gene for the enzyme concerned and that this changes the sequence of amino acids. Many explained that the enzyme molecule changes shape so that the substrate molecule does not fit into the active site. A common misconception was that the mutation changed the amino acid sequence of DNA or the base sequence of proteins. Some responses just stated that the 'DNA was changed' which was insufficient. Some only stated that the mutation caused the synthesis of an abnormal enzyme. A common error was to state that the substrate changes shape rather than the active site.

(c) Many candidates clearly understood why two sunflower plants with the tall phenotype can have offspring with the dwarf phenotype, but not all used appropriate terminology. Good responses used the terms *heterozygous* and *recessive allele* in concise answers that were occasionally illustrated by a Punnett square or a 'criss-cross' diagram. Incorrect phraseology included 'heterozygous dominant' and 'heterozygous allele'. Many thought that only one of the parents carried the recessive allele. In some cases, Punnett squares were drawn correctly, but the dwarf offspring were not identified. Although many stated that the parents were heterozygous, the fact that the allele for dwarfism is recessive was often not included in the response.

(d) (i) Most candidates identified the type of reproduction shown by the strawberry plant in Fig. 2.2 as asexual. However, some went on to explain what happens in self-pollination which is a form of sexual reproduction. Good responses stated that mitosis is involved in asexual reproduction and that the offspring are genetically identical to each other and to the parent plant.

(ii) The most common disadvantage of asexual reproduction given was the lack of variation. Some responses gave very clear explanations of the consequences for disease. Some stated that if the parent did not have resistance to a particular disease, then none of the offspring would be resistant and they would all be killed if the disease spread. They also made it clear that if the parent had an allele that led to a genetic disease, then all, or many, of the offspring would have the same inherited defect. A common error was to include details of selective breeding which was not relevant.

Question 3

(a) (i) Many candidates gave a feature of xylem vessels and a suitable explanation. Some responses were not sufficiently detailed, for example stating that there were 'holes' in the xylem vessels but not where the holes were, so it was unclear as to whether they were referring to pits or the end walls of the xylem vessels.

(ii) Most candidates knew that transpiration is involved in the movement of water in the xylem, although further explanations often showed limited understanding of the principles involved. Good responses began by explaining that water evaporates from mesophyll cells in the leaves and the water vapour molecules diffuse out of leaves. This led on to refer to the cohesion between water molecules and the concept of transpiration pull. Many stated that cohesion is the attraction between water molecules. Common errors included stating that water moves within the xylem vessels by osmosis and making references to water concentration rather than water potential.

(iii) Many candidates knew that xylem vessels provide support for plants. Some did not read the question carefully stating that xylem vessels transport minerals. Other incorrect responses included the anchorage of plants and the xylem being a site for storage.

(b) Many candidates gave a good explanation. Some incorrectly referred to 'stomata cells opening'.

Question 4

(a) Most candidates gave the correct definition. Common errors included giving examples rather than a definition or the stating the difference between hormonal and nervous communication.

(b) (i) Most candidates gave the correct values. A common error was to give the value for **B** in the **A** answer line and vice versa.

(ii) Some candidates gave the correct value for the percentage increase but many found this challenging. Most read the figures from the graph correctly but then were unsure of the next step. Often, values below 100% were seen as the smaller number had been used for the numerator. Some calculated a percentage greater than 100% but then subtracted it from 100 to give the percentage increase. Not all knew that percentage increases can be much greater than 100%.

(iii) Only the best responses made comparisons between **A** and **B**. Many only gave a description without any comparison. It was quite common for responses to include comments about the readings for the first 60 minutes that includes the time *before* drinking the glucose solution.

(iv) Explanations of the results of the glucose tolerance test for **B** generally dealt with the role of insulin in the conversion of glucose to glycogen. Many candidates were careful over their spelling of glycogen although some spellings were too close to glucagon to be accepted. Some explained that glucagon was responsible for the decrease in blood glucose concentration. Many did not follow the command word and wrote a lengthy description of the changes shown in Fig. 4.1 which did not answer the question. A common error was to state that the liver releases insulin and that the brain detects the rise in glucose concentration and instructs the pancreas to release insulin. It is the pancreas itself that monitors blood glucose, although some credit was given for the idea of 'detection' even if the brain, or other organ such as the liver, was given as the organ concerned.

(v) Many candidates gave three symptoms of Type 1 diabetes.

Question 5

(a) There were many good descriptions of the appearance of the three blood cells. Most wrote about the lack of nuclei in the red blood cells and the appearance of the nuclei in lymphocytes and phagocytes although the descriptions were not always accurate. Some commented on the shapes of the cells rather than the nuclei possibly because they did not recognise the nucleus within the lymphocyte or phagocyte. The accounts of the functions of these three cells were good and many excellent responses were seen for this question. Not all could recall the role of red blood cells.

(b) (i) Most candidates completed the flowchart correctly. The spelling of fibrinogen was not always correct. A common error was to give the two substances the wrong way round.

(ii) Almost all candidates gave two correct roles of blood clotting. One error was to describe problems that occur as a result of a blood clot rather than the role of blood clotting.

(c) (i) Most candidates gave the correct responses. A minority gave the phenotypes instead of the genotypes. Common errors included identifying all three as female, omitting the sex chromosomes entirely or writing an allele against the Y chromosome, e.g. $X^H Y^H$.

(ii) Common incorrect responses to this question were 0 per cent, 33 per cent, 50 per cent, 3:1 and 1:4. However, many completed a genetic diagram in the space provided to find that the answer is 25 per cent or a quarter. Some arrived at the correct answer even though their diagrams showed that they had assumed that the gene for blood clotting is not on a sex chromosome.

(iii) Definitions of *sex-linked characteristic* were not as good as those for *hormone* in **Question 4(a)**. Many responses gave definitions of features that are shown *only* by one sex. These are known as sex-limited characteristics. The most common error was to omit the statement that sex-linked characteristics are controlled by genes on a sex chromosome, X or Y. Some candidates referred to sexually transmitted infections or secondary sexual characteristics that arise during puberty.

Question 6

(a) (i) Some candidates gave correct features of reptiles. Responses often gave features that are characteristic of all vertebrates or of all quadrupeds. Many knew that reptiles lay eggs, but did not qualify this by stating that the eggs are leathery or do not have hard shells. Fish (and birds) also have scales and so scales alone was insufficient.

(ii) Most candidates gave two correct responses for this question. Chloroplasts and cell walls were the most common features given.

(b) (i) Most candidates gave the correct enzyme. Maltase and protease were seen occasionally and a few candidates gave lipase or pepsin.

(ii) The majority of responses were correct. The liver, stomach and pancreas were the commonest incorrect answers.

(c) This question was well-answered by majority of candidates. It was good to see some refer to seed banks, but the majority concentrated on ways that are suitable for conserving animals rather than plants. It could be argued that the conservation of plant species is more important to the future of the biosphere than the conservation of animals. Some responses referred to breeding but either did not further qualify it as captive breeding or incorrectly went on to discuss selective breeding. Selective breeding would not be appropriate for the conservation of a wild species as one aim is to increase genetic diversity of each species, not to decrease it.

(d) Many good examples of resources were given.

BIOLOGY

Paper 0610/43
Theory (Extended)

Key messages

- For questions where a limited number of responses are required (e.g. State **one** type of...) only the first response will be considered.

General comments

Candidates were well-prepared to answer questions on the entire syllabus, there was some evidence a minority were less secure in their knowledge of the lymphatic system in **Question 6**.

Comments on specific questions

Question 1

(a) (i) Almost all candidates gave the correct response. Common errors were to give the name of a tissue, cell or organelle. 'Leaves' was a less common incorrect response.

(ii) Most candidates gave the correct response. Colon was the commonest incorrect response; while it does absorb water it does not absorb the most water.

(iii) Although many candidates knew that water was a solvent, a common error was to give a use of water such as hydration.

(b) Many candidates identified and described at least one stage in the water cycle, but very few completed the whole table correctly. The most frequently seen incorrect response was that **Q** was condensation rather than **P**. Although the majority correctly identified **H** as the letter for transpiration, some descriptions stated that water, rather than water vapour, was lost from plants. A minority confused respiration and transpiration.

(c) (i) Almost all candidates knew why polluted water should be treated before drinking it.

(ii) There were some very detailed answers that described the treatment of sewage. The majority of the responses included a correct reference to the use of chlorination to treat the water. The best responses were well structure and gave sufficient detail for each treatment stage and gave the stages in the correct order. Less confident responses lacked detail, for example they made a reference to filtering but did not say what was removed during this stage.

Question 2

(a) Many candidates applied their knowledge to determine the number of chromosomes in the image of the chromosomes of a diploid nucleus from an Indian muntjac deer. Some responses did not consider the species in the question and answered in the context of humans giving 46 or 23 pairs as the answer. Another common error was to refer to just three chromosomes rather than three pairs of chromosomes.

(b) There were some good comparisons of the unusual sex chromosomes in the male and female muntjac deer. A few incorrect responses compared either all of the chromosomes or the autosomal chromosomes, rather than the sex chromosomes. Others used the term allele instead of chromosome.

(c) Many candidates followed the instructions to use the words *gamete* and *chromosome* in their explanations of how meiosis results in variation. Meiosis seemed to be a topic that many of the candidates were confident in describing. Fewer responses explained how meiosis brings about variation. Common misconceptions included statements about the fusion of chromosomes, rather than the fusion of gametes at fertilisation and descriptions of fertilisation that implied it was part of the process of meiosis.

(d) Some candidates gave excellent responses that made reference to mutations as a source of new alleles. Many responses referred to sexual reproduction or natural selection as being responsible for new alleles; these processes lead to different combinations of alleles rather than the generation of new ones.

Question 3

(a) (i) Almost all candidates labelled two cell structures correctly. The commonest incorrect label was chloroplast.

(ii) The majority of candidates knew that the tissue was the (upper) epidermis. Common errors included cuticle, mesophyll and epithelial.

(iii) Many candidates gave excellent responses to this question.

(b) Most candidates knew that stomata are involved in gas exchange, but fewer gave a full description of their function. Many focused exclusively on the role of stomata in transpiration and water loss and did not discuss the role more generally in terms of the diffusion of gases, or their association with photosynthesis and respiration.

(c) (i) Again many excellent responses were seen for this question. The best responses included a correct description of the movement of ions against a concentration gradient using energy from respiration. Some also included a description of the role of proteins in this process.

(ii) The best responses made the link to osmosis from the data presented in Table 3.1. Those that did not make the link tended to write about stomata opening to allow ions and/or water to move.

(iii) The commonest correct responses were low humidity and high temperatures. Some responses were incomplete as they gave only ‘temperature’, ‘humidity’ or ‘sunlight’ without any qualification. Low light intensity was a common incorrect response.

Question 4

(a) (i) Most candidates stated that mitochondria are involved in energy release, but not all went on to state that energy release from mitochondria involves aerobic respiration.

(ii) Many candidates knew that enzymes are catalysts.

(b) Many candidates gave excellent responses to this question. Almost all were able to describe some of the steps in the pathway of delivering glucose to a fetus.

(c) (i) Many candidates defined the term hormone, but many responses gave examples rather than a definition. Many answers mentioned that a hormone is carried in the bloodstream to a target organ, but did not indicate that it has an effect on that organ’s activity.

(ii) While most were able to correctly read the data points from the graph, fewer were able to calculate the percentage increase. Another common error was to omit the rounding so values were not presented as a whole number as instructed.

(iii) Many candidates gave correct descriptions of the graph, fewer provided a correct explanation. A common error was to state that the increase to the peak began at day 10 (rather than day 20). Many described the graph in terms of the rise and fall in glucose concentration instead of changes in glycogen concentration. Others described how glycogen was increasing as it was being used for energy, rather stating that it was increasing because it was being stored. Some stated that the increase was for regulating glycogen concentration instead of the result of regulating the concentration of glucose in the fetal blood.

(d) A wide range of suggested disadvantages of breast-feeding were seen, including a number of misconceptions. The most common correct answers given were that it can be painful, time consuming and that only the mother can produce milk. Candidates did mention the risk of infection to the baby, but rarely included sufficient detail in these statements. There were many incorrect references to formula milk having more appropriate nutrients for the baby; this is only true in cases where the mother is malnourished and unable to provide sufficient nutrients for herself and the baby and hence only credited in that context. Some response incorrectly gave advantages of breast-feeding, such as providing passive immunity.

Question 5

(a) Although the majority of candidates stated that xerophytic plants are adapted to dry environments, it was a common misconception that these environments are always hot or tropical.

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

(ii) Many candidates knew that discontinuous variation is determined by genetics only, but fewer were able to express themselves clearly enough to also describe the specific features of discontinuous variation. 'No range of intermediates' was seen more commonly than the limited number of categories.

(c) A wide range of characteristics of leaves that show continuous variation were given. A common error was to list two xerophytic features.

(d) Many excellent reasons were suggested for the change in the profile of the characteristic after a year. A common error was to give a factor, such as the environment, without the idea that the factor has changed in the intervening year.

Question 6

(a) (i) Almost all candidates knew that oxygen would move from a capillary to body cells by diffusion.

(ii) Although excellent descriptions of how plasma is pushed out of a capillary were seen, many candidates did not seem familiar with this concept. Many candidates who were unfamiliar with this concept suggested that the process would occur by osmosis. This would account for a relatively small volume of the fluid that moves because of the higher resistance associated with the pathway through membranes, rather than through the pores in capillary walls.

(iii) Many candidates named a component of blood that would remain in the capillaries.

(b) (i) The structure of a vein was well-known by almost all candidates. A common incorrect response was to describe the role of veins rather than the structure. Thin walls and a large lumen were the most common correct responses.

(ii) A few responses were able to confidently describe the role of the lymphatic vessels. Commonly, the vessels were linked to lymphocytes and immunity. A common misconception was that lymphatic vessels transport blood.

(c) The majority of candidates were familiar with the structure and function of lacteals.

(d) (i) Only a minority of candidates knew that lymph nodes contain large numbers of lymphocytes.

(ii) Many excellent responses were seen for this question.

BIOLOGY

Paper 0610/51
Practical Test

Key Messages

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

Candidates should be familiar with performing calculations such as percentage change, averages and using the magnification formula.

A sharp pencil should be used for drawings and graphs.

General Comments

Most candidates could confidently draw tables and graphs and most did a good drawing of the alveoli and capillary.

Comments on Specific Questions

Question 1

(a) (i) The question proved challenging to many. Candidates were expected to subtract the volume of the water from the total volume of water and grapes. Many did not subtract 50 cm^3 from their value.

(ii) Most candidates were able to use their answer from **1(a)(i)** and divide by four to find the average volume of one grape.

(iii) Most candidates drew a suitable table with appropriate headings. A common error was to include units in the data cells.

(b) (i) Some candidates were able to give a correct concentration. Many found this question challenging.

(ii) Most candidates stated a correct conclusion for the data.

(c) (i) The vast majority of candidates were able to identify a variable that was kept constant.

(ii) The majority of candidates found this question challenging. Many stated time but with no further qualification. It was important that the improvement matched the error that was given. Some correctly stated that determination of colour is subjective and provided a feasible improvement.

(iii) Many good responses were seen for this question. Most were able to identify the precaution of wearing safety goggles to prevent damage to the eyes from the solutions.

(d) Many candidates described how they would collect grapes of different ages. In some responses this was extremely detailed which was not necessary. Fewer discussed how they would know which grapes had a higher concentration of reducing sugars.

(e) (i) It was pleasing to see that a large number of candidates were able to correctly calculate the percentage change in volume of the grapes.

(ii) Most candidates were able to draw a suitable graph. A common error was to omit the units from the axes labels. Some were also able to join the points or draw a suitable line. Errors included extrapolating the line to the origin which was not appropriate for the data.

(iii) Many excellent descriptions which covered all the points were seen. The most common error was not using the data to support the statements made or not including the units when quoting data. It was encouraging to see than many candidates gave appropriate conclusions based on the data provided.

(iv) Most candidates correctly identified the age of the grapes as the independent variable.

Question 2

(a) (i) Most candidates were able to correctly measure the diameters of the capillary and calculate the average value. The most common error was stating incorrect units.

(ii) Many candidates found this question challenging and errors were made at different points in the calculation. For example, some multiplied by 1200 instead of dividing. Some did not convert correctly to micrometres and some did not round their final answer to the nearest whole micrometre.

(iii) Most candidates made a good attempt at the drawing. The most common errors were to include shading or cells in the drawing. It was pleasing to see that most drew a reasonably sized drawing, with only a few being too small. The commonest error was to draw individual cells.

(b) (i) Most candidates were able to calculate the correct average value.

(ii) Some candidates had a very clear idea of how to plan a valid investigation. There were a number of detailed descriptions of the investigation that covered all the marking points. Most candidates were able to discuss the idea that the intensity would need to be varied or at least compared during exercise and at rest. The most common error was to give a theoretical explanation as to why chest circumference increases during exercise which did not answer the question. Very few identified the variables that would need be kept constant.

BIOLOGY

Paper 0610/52
Practical Test

Key messages

Candidates should be familiar with standard laboratory equipment and know what types of apparatus are suitable for different experiments.

The best responses showed a secure understanding of how to:
- construct tables that have clear headings with units and correct presentation of repeated measurements
- measure distances to the nearest whole millimetre and times to the nearest whole second
- plan an experiment that shows how the independent variable will be changed, how the dependent variable will be measured and how other variables will be kept constant
- use specific terms such as 'accurate' correctly.

General comments

The majority of candidates showed a good understanding of the skills required.

The construction of tables is a skill that many find challenging, particularly when repeated measurements need to be recorded.

Not all were confident in their understanding of the purpose of a control or the reasons for repeating an experiment.

Supervisor reports are essential and ensure that examiners fully understand and can take into account problems that have occurred on the day of the exam or the impact of the substitution of materials on results. Where substitutions have been made, or an issue has occurred during the practical, as much detail as possible should be included in the supervisor's report.

Comments on specific questions

Question 1

(a) The majority of candidates calculated the percentage concentration correctly. A common error was to report the value with more than one decimal place.

(b) The majority of candidates were able to construct a table with a suitable number of columns and rows to record their results. The best responses gave acceptable column and row headings. The most common errors were to omit the units for time or for the height of the precipitate. The results obtained by candidates varied widely, often within the same session at a centre. It was not clear in many cases what was being were measured as the results obtained over time did not show a consistent pattern. It was expected that the height of the precipitate would decrease over time in **P1**, **P2** and **P3** and that no precipitate would form in **P4**. Results that did not fit this pattern but showed a consistent change or matched the supervisor's results were accepted.

(c) Most candidates gave one correct conclusion for the data. The best responses showed an understanding that the higher the concentration of pectinase the greater the clarification and without pectinase no clarification occurred. One error was to refer to the volume of pectinase rather than the concentration.

(d) (i) Most candidates gave a correct response. Not all were certain of the difference between volume and concentration.

(ii) Most candidates gave at least one correct response, commonly the volume of apple juice, the temperature and the time intervals at which measurements were made.

(iii) Many found this a challenging question. The best descriptions of the 'error' provided sufficient detail for each marking point. A common incorrect response was 'parallax error', which was not appropriate in this context.

(e) Most candidates identified **P4** as a control, but fewer showed an understanding of the role of a control.

(f) Many excellent plans were seen. The best responses showed an understanding that; apple juice with and without pectinase would need to be tested, identified which variables needed to be kept constant and gave a clear description of how they would use DCPIP to estimate the vitamin C content of fruit juice. Less well-executed responses tended to omit the sample of untreated apple juice. Some stated that DCPIP was used but did not give any detail of a method for its use. A common error was the use of Benedict's reagent to test for the presence of vitamin C.

(g) Almost all candidates gave a correct response.

(h) The quality of drawing was very variable. The best responses had clear, clean lines that had been drawn with a sharp pencil. They also showed good observation skills so that the shape of the 'compartments' in the tomato fruit were drawn accurately. The majority of drawings were large enough. A common error was to omit the central tissue mass in each of the 'compartments' within the fruit.

Question 2

(a) The majority of candidates measured the petal accurately and calculated the magnification correctly. The only common error was to omit the units from the measurement of the petal. A few measured in centimetres but did not convert this value to millimetres before calculating the magnification.

(b) (i) Almost all candidates counted the number of petals correctly.

(ii) Most candidates calculated the average correctly. The only common error was to give the answer as a decimal rather than as a whole number as instructed in the question.

(iii) Most candidates suggested an appropriate method. The most common were to number or mark the petals, or to remove the petals as they were counted to avoid counting the same one twice.

(c) The majority of candidates plotted the bar chart correctly. The most common error was to draw a histogram rather than a bar chart i.e. no space between the bars on the chart. Some were unable to scale the axes appropriately which either made correct plotting difficult or resulted in a chart that was too small for the size of the grid.

(d) Many candidates found this question challenging. The best responses showed an understanding that results may be anomalous and that additional counts increase reliability. A common error was stating that results would be more accurate.

(e)(i) The majority of candidates gave a correct description. Candidates should be aware that for Benedict's reagent to act work quickly a high temperature of 80°C or more is needed.

(ii) Almost all candidates gave a suitable safety precaution. The most common were; safety glasses, wearing protective gloves and using a water-bath for heating.

BIOLOGY

Paper 0610/53
Practical Test

Key Messages

- Identification of the independent and variables dependent is vital for the planning question. The variables that need to be kept constant must also be considered and included in a plan.
- Candidates should also try to match the answers they give with the number of marks available for each part of a question. It is likely that a three-mark question will require three distinct points for example.
- 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 are derived from learned methods.
- When asked about safety considerations, candidates should identify a risk, but also identify a method of reducing that risk.
- When mistakes are made they should be crossed out completely and the alternative answer should be written in a suitable blank space. Avoid writing in pencil and then overwriting in pen as it can be difficult to read.

General Comments

Candidates performed well on the majority of the paper, showing good preparation and familiarisation with the type of questions asked.

Most candidates performed well on the planning exercises, producing well thought-out logical investigations. Identification of variables, safety and a workable method are key aspects of this task.

Graph drawing was a skill that most candidates continue to perform well on. A few plotted values incorrectly or did not label the axes of their graph. Similarly, drawing of a table for data was done well by the majority of candidates, with correct headings and units.

The drawing skills of most candidates were adequate and included a suitable level detail. Although some produced lines that were incomplete or feathered. Drawings should be neat, in proportion, and show sufficient detail.

Comments on Specific Questions

Question 1

(a) (i) Most candidates were able to carry out the investigation and then record their data in an appropriate table. Some wrote units in the data cells, but overall the quality of the tables presented this year was pleasing.

Some candidates measured the height of the foam from the surface of the hydrogen peroxide while others measured the height of the foam from the base of the test-tube. Both methods were acceptable. Similarly, measurements could have been recorded as mm or cm, as long as the units matched the values recorded.

Candidates should remember that each column needs a suitable heading.

(ii) Some candidates found this question quite challenging, but a good proportion gave thoughtful answers such as measuring from the same point in each tube.

(iii) Some very clear and concise conclusions were seen in which candidates linked the cooking method to the height of foam produced. Only a few candidates gave incorrect conclusions in which the concentration of enzyme was described.

(b) (i) A common error was to state the dependent variable instead of the independent variable.

(ii) This was particularly well-answered by candidates. Most could list three variables that were kept constant. The most common error was when answers lacked detail. Some wrote simply 'temperature'. The temperature of the potato with hydrogen peroxide was kept constant, but the temperature of the potato before incubation was altered. Candidates should also try to avoid using the term 'amount' as in this context it could refer to size, volume or concentration.

(c) Candidates found this question challenging. Human errors or operator errors, such as poor timing or incorrect measurement of volumes or heights, were not appropriate. If the method states that 15cm^3 was added then the candidate must assume that this was achieved. Similarly, if it was stated that the solution was left for three minutes then we have to assume that it was.

Not all responses were sufficiently detailed. Not controlling temperature was insufficient as we needed to know when this occurred (i.e. during incubation with hydrogen peroxide or during the pre-incubation period).

(d) The planning activity was carried out very well. Many gave a clear method, often using a gas syringe, and were able to correctly identify suitable variables and safety procedures. A few candidates simply repeated the method already given to investigate the effect of cooking.

(e) Nearly all candidates correctly described the food tests for starch and reducing sugars, although a significant number did not include the requirement to heat the Benedict's reagent.

Question 2

(a) (i) Almost all candidates correctly recorded the position of the two drops, although some common errors included:

- misreading the scale as 42 mm and 2 mm
- giving answers in cm rather than mm
- taking measurements from the tube rather than using the ruler scale provided.

(ii) Some candidates divided the value from **2(a)(i)** by 60 rather than 30, and others gave their answer to two decimal places, but otherwise the question was answered well.

(b) (i) The bar chart was well constructed by the vast majority of candidates. It should be noted that the bars should not touch when plotting this type of data and candidates need to make sure that they use at least half of the plotting area when choosing what scale to use.

(ii) Almost all candidates chose **C** as the correct answer.

(iii) Some candidates found this question more challenging, with confusion over what needed to be weighed. Some candidates weighed the test-tube or potassium hydroxide and did not mention the mass of the animal. A correct answer required the rate of movement of the bubble to be divided by the mass. However, some used the distance moved by the bubble instead of its rate of movement.

(c) (i) The drawings of the woodlouse were generally pleasing. Most candidates produced an enlarged drawing that included sufficient detail. The commonest error was an outline that was feathery or had numerous breaks and overlaps.

(c)(ii) Most candidates correctly calculated the actual size, included suitable units and gave their answer to two decimal places. The most common error was an incorrect rearrangement of the equation so that a correct measurement of line **PQ** gave an incorrect answer.

BIOLOGY

Paper 0610/61
Alternative to Practical

Key messages

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

Candidates should be familiar with performing calculations such as percentage change, averages and using the magnification formula.

A sharp pencil should be used for drawings and graphs.

General comments

Most candidates could confidently draw tables and graphs and most did a good drawing of the alveoli and capillary.

Comments on specific questions

Question 1

(a) (i) Many candidates were able to read the correct volume on the measuring cylinder and then go on to calculate the volume of water displaced. Not all were familiar with how to read a value from a meniscus. A common error was just to report the total volume of water and grapes without subtracting the initial 50 cm^3 of water, when stating the total volume of the grapes.

(ii) Most candidates were able to use their answer from **1(a)(i)** and divide by four to find the average volume of one grape.

(iii) Most candidates drew a suitable table with appropriate headings. A common error was to include units in the data cells. Some only recorded the data for trial 1 and not for both trials, and some did not record the times in seconds as instructed.

(b) (i) Candidates found it challenging to use the information in the methodology and the question to calculate the concentration of reducing sugar in S2.

(ii) The majority of candidates gave a suitable conclusion.

(c) (i) The most common responses for this question were temperature and the volume of the solutions or the volume of Benedict's solution.

(ii) The majority of candidates found this question challenging.

The most common correct responses were about the difficulty of judging the colour change by eye and the use of a colour chart being used as an improvement to reduce this error. Some candidates also correctly thought that more than two trials should have been carried out or that each solution should have been investigated separately rather than all at the same time.

A common mistake was to describe an example of human error, such as not measuring the volumes accurately. Some thought that using grapes of different sizes was an error.

(iii) Most candidates gave a correct response to this question. The most common correct ideas were that gloves or eye protection was required for toxic or hot solutions. Some incorrectly thought that distilled water was dangerous or that gloves were being worn so that their hands wouldn't get dirty or contaminate the solutions.

(d) The best responses referred to testing grapes at different stages of development. Fewer then went on to say that the grapes had to be tested with Benedict's (as before) to find the time at which a colour change first appears. Some simply said that the investigation was carried out as previously, or that results were recorded or that the different grapes were compared which was insufficient.

(e) (i) The majority of candidates gave a correct response to this question. The most incorrect values were 25 and 20.

(ii) The best responses labelled the axes appropriately and gave an even scale on both axes. Most candidates were able to plot accurately and draw a suitable line to join the plotting points. The most common errors were to label the *x-axis* as 'age of grapes' without the unit of days or to extrapolate their line to zero.

(iii) Most candidates concluded that as the grapes increased in age the percentage change in volume increased. Few went on to describe the difference in the gradient of the line up to 84 days and after 84 days.

(iv) The majority of candidates were able to identify the variable that was changed. The commonest errors were to say that this variable was time or the percentage change in volume.

Question 2

(a) (i) Most candidates confidently answered this question. Candidates should be encouraged to measure in millimetres for measurements such as this, as errors occurred when candidates measured in centimetres and then had to convert their measurements to millimetres or micrometres.

(ii) Many candidates found this question challenging and errors were made at different points in the calculation. For example, some multiplied by 1200 instead of dividing. Some did not convert correctly to micrometres and some did not round their final answer to the nearest whole micrometre.

(iii) Most candidates made a good attempt at the drawing. The most common errors were to include shading or cells in the drawing. It was pleasing to see that most drew a reasonably sized drawing, with only a few being too small.

(b) (i) Most candidates were able to calculate the correct average value.

(ii) Most candidates used the information given to describe an investigation in which students' chest circumference was measured when exercising and when at rest. Fewer described changing the intensity of exercise or described the variables that would be kept constant. Some stated that the chest circumference should be measured immediately after completing the exercise, but few candidates discussed safety precautions such as using only healthy participants. The most common error was to give a theoretical explanation as to why chest circumference increases during exercise which did not answer the question.

BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

There were many excellent scripts with accurate, thoughtful responses, which were clearly and logically produced.

Instructions to give an answer to the nearest whole number, or to one decimal place, should be followed.

General comments

Many candidates would find it helpful to draw tables, diagrams and graphs in pencil. Mistakes can then be rectified and necessary additions made very easily.

It is important for candidates to realise that when an investigation is planned, at least three sets of results should be obtained.

When asked to state a relevant safety precaution for an investigation, the precaution should be specific to the investigation in question.

A successful plan for an investigation shows how the independent variable will be changed, how the dependent variable will be measured and how other variables will be kept constant. It is also usual to plan to take three sets of results (i.e. first set of readings is repeated twice more). The number of repeats or trials should be specified in the plan.

Comments on specific questions

Question 1

(a) Most candidates carried out the calculation correctly. Fewer gave their answer to one decimal place as instructed.

(b) Most candidates constructed a suitable table and entered the data correctly. Some gave correct header titles with units. A common error was to write the units in the data cells rather than just in the table header.

(c) Most candidates gave one correct conclusion for the data. A common error was to describe the data rather state a conclusion.

(d) (i) Most candidates gave a correct response. Not all were certain of the difference between volume and concentration.

(ii) Most candidates gave two correct responses. The most frequently chosen variables were the volume of apple juice, using the same apple juice and the temperature.

(iii) Many found this a challenging question. Common incorrect responses were ‘parallax error’ and ‘shaking the test-tube whilst measuring’. Many thought that using ‘a more accurate ruler’ would be an improvement.

(e) Many candidates identified the test-tube **P4** as a control and correctly stated its purpose.

(f) There were some excellent plans produced for investigating the hypothesis. A large number of candidates knew that DCPIP was a reagent that could be used to test for the presence of vitamin C. Some understood that repeats of an investigation need to be carried out at least twice (i.e. performed three times in total).

(g) The overall standard of drawings continues to improve, with many candidates producing excellent drawings that met all the assessed criteria. There were few drawings that were too small or too large (i.e. extending into the text). Most of the lines were clear and completely continuous. Usually five compartments were shown, each containing a correctly shaped tissue mass.

(h) Most candidates gave the correct response. 'Blue' unqualified was insufficient as it could not be distinguished from other food tests.

Question 2

(a) Most candidates measured the line correctly and stated a unit that matched the measurement they had recorded. A common error was to measure the line **XY** in centimetres but not to also convert the actual size of the petal from millimetres to centimetres so that the incorrect values were used in the formula for magnification. Another common error was to give the magnification value with a unit such as mm.

(b) (i) Almost all candidates counted the number of petals correctly.

(ii) Most candidates calculated the average correctly. The only common error was to give the answer as a decimal rather than as a whole number as instructed in the question.

(iii) Most candidates suggested an appropriate method. The most common were to number or mark the petals, or to remove the petals as they were counted to avoid counting the same one twice.

(c) The majority of candidates plotted the bar chart correctly. The most common error was to draw a histogram rather than a bar chart i.e. no space between the bars on the chart. Some were unable to scale the axes appropriately which either made correct plotting difficult or resulted in a chart that was too small for the size of the grid.

(d) Many candidates found this question challenging. The best responses showed an understanding that results may be anomalous and that additional counts would increase reliability. A common error was stating that results would be more accurate.

(e) (i) Most candidates knew the test and described it accurately. The most common omission was that of heating the reactants. It needs to be noted that just using a water-bath is unacceptable, as water-baths can be cold as well as hot. The best responses specified a hot water-bath or a temperature of at least 80°C.

(ii) The majority of candidates gave a suitable precaution. Common correct responses included using eye-protection, wearing gloves or handling hot apparatus with tongs.

BIOLOGY

Paper 0610/63
Alternative to Practical

Key Messages

- Identification of the independent and variables dependent is vital for the planning question. The variables that need to be kept constant must also be considered and included in a plan.
- Candidates should also try to match the answers they give with the number of marks available for each part of a question. It is likely that a three-mark question will require three distinct points for example.
- 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 are derived from learned methods.
- When asked about safety considerations, candidates should identify a risk, but also identify a method of reducing that risk.
- When mistakes are made they should be crossed out completely and the alternative answer should be written in a suitable blank space. Avoid writing in pencil and then overwriting in pen as it can be difficult to read.

General Comments

Candidates performed well on the majority of the paper, showing good preparation and familiarisation with the type of questions asked.

Most candidates performed well on the planning exercises, producing well thought-out logical investigations. Identification of variables, safety and a workable method are key aspects of this task.

Graph drawing was a skill that most candidates continue to perform well on. A few plotted values incorrectly or did not label the axes of their graph. Similarly, drawing of a table for data was done well by the majority of candidates, with correct headings and units.

The drawing skills of most candidates were adequate and included a suitable level detail. Although some produced lines that were incomplete or feathered. Drawings should be neat, in proportion, and show sufficient detail.

Comments on Specific Questions

Question 1

(a) (i) Most candidates were able to follow the investigation and record the data in an appropriate table. Some wrote units in the data cells, but overall the quality of the tables presented this year was pleasing.

Some candidates measured the height of the foam from the surface of the hydrogen peroxide while others measured the height of the foam from the base of the test-tube. Both methods were acceptable. Similarly, measurements could have been recorded as mm or cm, as long as the units matched the values recorded.

Candidates should remember that each column needs a suitable heading.

(ii) Almost all candidates were able to calculate the difference in height of the foam in cooked and uncooked potato, but several omitted the units.

(iii) Some candidates found this question quite challenging, but a good proportion gave thoughtful answers such as measuring from the same point in each tube.

(iv) Some very clear and concise conclusions were seen in which candidates linked the cooking method to the height of foam produced. Only a few candidates gave incorrect conclusions in which the concentration of enzyme was described.

(b) (i) A common error was to state the dependent variable instead of the independent variable.

(ii) This was particularly well-answered by candidates. Most could list three variables that were kept constant. The most common error was when answers lacked detail. Some wrote simply 'temperature'. The temperature of the potato with hydrogen peroxide was kept constant, but the temperature of the potato before incubation was altered. Candidates should also try to avoid using the term 'amount' as in this context it could refer to size, volume or concentration.

(c) Candidates found this question challenging. Human errors or operator errors, such as poor timing or incorrect measurement of volumes or heights, were not appropriate. If the method states that 15cm^3 was added then the candidate must assume that this was achieved. Similarly, if it was stated that the solution was left for three minutes then we have to assume that it was.

Not all responses were sufficiently detailed. Not controlling temperature was insufficient as we needed to know when occurred (i.e. during incubation with hydrogen peroxide or during the pre-incubation period).

(d) The planning activity was carried out very well. Many gave a clear method, often using a gas syringe, and were able to correctly identify suitable variables and safety procedures. A few candidates simply repeated the method already given to investigate the effect of cooking.

(e) Nearly all candidates correctly described the food tests for starch and reducing sugars, although a significant number did not include the requirement to heat the Benedict's reagent.

Question 2

(a) (i) Almost all candidates correctly recorded the position of the two drops, although some common errors included:

- misreading the scale as 42 mm and 2 mm
- giving answers in cm rather than mm
- taking measurements from the tube rather than using the ruler scale provided.

(ii) Some candidates divided the value from **2(a)(i)** by 60 rather than 30, and others gave their answer to two decimal places, but otherwise the question was answered well.

(b) (i) The bar chart was well-constructed by the vast majority of candidates. It should be noted that the bars should not touch when plotting this type of data and candidates need to make sure that they use at least half of the plotting area when choosing what scale to use.

(ii) Almost all candidates chose **C** as the correct answer.

(iii) Some candidates found this question more challenging, with confusion over what needed to be weighed. Some candidates weighed the test-tube or potassium hydroxide and did not mention the mass of the animal. A correct answer required the rate of movement of the bubble to be divided by the mass. However, some used the distance moved by the bubble instead of its rate of movement.

(c) (i) The drawings of the woodlouse were generally pleasing. Most candidates produced an enlarged drawing that included sufficient detail. The commonest error was an outline that was feathery or had numerous breaks and overlaps.

(c)(ii) Most candidates correctly calculated the actual size, included suitable units and gave their answer to two decimal places. The most common error was an incorrect rearrangement of the equation so that a correct measurement of line **PQ** gave an incorrect answer.