

BIOLOGY

Paper 0610/12
Multiple Choice (Core)

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

General comments

There was good understanding of how to calculate the magnification of a specimen, the effect of temperature on the rate of enzyme action, the definition of transpiration, fertilisation and the parts of the human excretory and reproductive systems.

There was some uncertainty about species producing fertile young, the characteristics of the arthropod groups, the differences between plant and animal cells and tropic responses. Some candidates were unfamiliar with the definitions of active transport and the causes of tooth decay.

It is important for candidates to work methodically through information provided in questions, such as in **Question 38**.

Comments on specific questions

Question 1

Many candidates appreciated that the experiment on woodlice demonstrated sensitivity. Some candidates incorrectly opted for respiration.

Question 2

Many candidates did not appreciate that only members of the same species can breed to produce fertile young and therefore option D was the correct answer.

Question 3

Many candidates were not familiar with the number of legs that different groups of arthropods possess.

Question 4

Many candidates appreciated that each animal cell will possess its own cell membrane and therefore at position X there would be two cell membranes. Some candidates incorrectly believed that the two cells would share a cell membrane. The question stated that the cells were animal cells so candidates could eliminate options **B** and **D** as they referred to cell walls.

Question 5

Many candidates appreciated that the cell was modified for the absorption of water by having a large surface area. Some candidates incorrectly believed that the large vacuole is an adaptation for the absorption of water.

Question 7

There was good understanding of what happens during diffusion by many candidates. Some candidates incorrectly believed that diffusion in the jar only occurs upwards.

Question 8

Some candidates were unfamiliar with the process of active transport and were uncertain of the direction of movement and the requirement for energy.

Question 9

Many candidates correctly selected option **A**, although some candidates incorrectly believed that a brick-red colour is a positive result for proteins. This suggests that there was some confusion about the tests for protein and reducing sugars.

Question 11

The shape of a curve that represents the effect of pH on the activity of a digestive enzyme was correctly identified by many candidates.

Question 15

While many candidates appreciated that the hole in the enamel of the tooth was made by acid, a significant number incorrectly opted for sugar.

Question 16

This item was well answered, although some candidates were uncertain about the products of protease and amylase catalysed reactions.

Question 17

Some candidates did not appreciate that xylem helps to support stems and leaves and selected option **D** as it referred to the movement of water.

Question 20

A significant proportion of candidates did not appreciate that it is the left ventricle that pumps blood to the aorta.

Question 21

Many candidates appreciated that mucus prevents pathogens from entering the body.

Question 22

The concentrations of gases in air leaving the lungs were not well known.

Question 23

Many candidates appreciated that the products of anaerobic respiration in yeast were alcohol and carbon dioxide. Some candidates incorrectly believed that the products were lactic acid and carbon dioxide.

Question 27

Some uncertainty exists about the tropic responses of roots and shoots. Roots are positively gravitropic and grow downwards whereas shoots are negatively gravitropic and grow upwards even in total darkness.

Question 28

While many candidates gave the correct response, some incorrectly believed that heroin decreases reaction times or that heroin is a stimulant.

Question 31

While many candidates appreciated that the method of birth control that works by preventing an egg from being released is the contraceptive pill, some candidates opted for the condom or vasectomy.

Question 33

While most candidates were aware of the sex chromosomes that are found in each type of cell, some did not appreciate that the embryo is formed by mitosis.

Question 37

The definition of a population was not well understood. A population describes the number of a particular species living in a given area. Therefore, option **B** was the correct choice. Option **A** was frequently chosen but could not be correct as arthropods include many species.

BIOLOGY

Paper 0610/22
Multiple Choice (Extended)

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

General comments

There was a good understanding of diffusion, cell division in plant sexual reproduction and the features of xerophytes.

There was some uncertainty about species producing fertile young, converting units and auxin controlling plant growth.

It is important for candidates to work methodically through information provided in questions, such as in **Question 19**.

Comments on specific questions

Questions 2

Most candidates did not appreciate that only members of the same species can breed to produce fertile young.

Question 6

Although many candidates derived the correct answer, some candidates had difficulty converting units.

Question 7

This question was well answered, showing good understanding of the process of diffusion, although some candidates incorrectly believed that diffusion occurs upwards only.

Question 19

While many candidates opted correctly, some candidates needed to take more care and work methodically through the information given.

Question 22

Many candidates correctly deduced the concentrations of oxygen and carbon dioxide in the air leaving the lungs as being 16% and 4.0% respectively.

Question 27

Many candidates appreciated that auxin is made in the shoot tip. Some candidates incorrectly opted for option **C** thinking that auxin elongates the cells in the shoot tip.

Question 34

Many candidates opted correctly. Some incorrectly believed that meiosis results in genetically identical pollen nuclei.

Question 36

It was appreciated by many candidates that the hairs surrounding stomata are an adaptation of xerophytes to their environment.

BIOLOGY

Paper 0610/32
Theory (Core)

Key messages

It is essential that candidates take time to read questions carefully and consider what they are being asked to do before they start writing each answer. There were a number of questions where instructions were not followed, meaning that the full range of marks was not available.

Candidates should be encouraged to take note of the number of marks allocated to each question as it indicates the number of separate points that have to be made in order to be awarded full credit.

General comments

A good standard of scientific knowledge was displayed by many candidates.

Candidates should be encouraged to use scientific terminology whenever possible and care should be taken not to confuse these terms or use them in the wrong context.

Comments on specific questions

Question 1

- (a) Candidates were asked to use a diagram of the alimentary canal and associated organs to identify which parts carried out specific functions. Most candidates performed well. Less well-known sites were where alcohol is broken down and where salivary amylase is produced.
- (b) Almost all candidates could identify the oesophagus but the identification of the gall bladder was less well-known. Common incorrect responses included bile, bile duct and bladder.
- (c) Candidates were asked to name three parts of the large intestine. Many candidates could correctly name the colon, rectum and anus. A significant number of candidates did not appreciate the distinction between the small and large intestines and incorrectly stated the ileum and duodenum.

Question 2

- (a) Candidates were presented with a bar chart giving information about the smoking habits of people in different age groups and were asked to state how the results for the youngest and the oldest age groups differed. The question was worth three marks so it was necessary for candidates to make three distinct points in order to gain full marks. Some candidates did not follow the instructions given and compared all five age groups rather than the two groups asked for.

Many candidates were not awarded marks as the comparisons made were incomplete. For example, when a candidate said, '*there are more smokers in the 16–20 (year-old) age group*', it is not clear whether the comparison is with the number of people who have stopped smoking in that age group, or the number of smokers in that age group is being compared with the number of smokers in the older age group.

Other candidates merely wrote out in words what the graph data showed, for example: '*20% of the 16–24-year-old people smoke tobacco and 10% of the people over 60 smoke tobacco*'. This does not constitute a comparison so cannot be awarded marks. It is necessary for candidates to make a statement along the lines of '*More people smoke tobacco in the 16–24 age group than in the 60+*

age group. An even stronger answer would be *'More than twice as many people smoke tobacco in the 16–24 age group than in the 60+ age group.'*

Some candidates misread the question and tried to give an explanation for the data. Many appeared to think that more young people smoked because they were fit and healthy and so would not suffer any adverse effects, whereas the older age group would all be unfit and unhealthy and so would suffer more ill-effects if they did smoke.

- (b) Many candidates knew that COPD and coronary heart disease were two diseases associated with smoking tobacco.
- (c) The fact that tar is the main carcinogen in tobacco smoke was not well-known. Candidates incorrectly cited both nicotine and carbon monoxide as being carcinogenic.
- (d) Candidates were asked to describe the effect of carbon monoxide on the gas exchange system. The most commonly known point was that the gas is toxic, or harmful, to humans. The reason for this was less well understood. Some candidates knew that carbon monoxide reduced the oxygen carrying capacity of the blood but very few were aware that it combined with haemoglobin.

Question 3

- (a) Candidates were shown a food web and their first task was to insert another feeding relationship. The majority of candidates drew the arrow correctly. A few placed the arrowhead at the incorrect end of the line.
- (b) Candidates had to indicate which roles the organisms played in the food web. Many identified the yucca plant as a producer but seemed unsure of the meaning of herbivore and carnivore. Identifying the consumers presented the most difficulties, with candidates being unaware that both carnivores and herbivores must also be consumers.
- (c) Many candidates named the mountain lion as the organism that was both a secondary and tertiary consumer. Some did not fully understand these terms as rattlesnake and coyote were both frequently stated as answers.
- (d) This question was well answered by most candidates. Almost all realised that the chuckwalla population would probably decline due to a lack of food. A few candidates did not answer the question asked and gave information about how other organisms in the food chain would be affected by the arrival of another cactus-eating organism.
- (e) This question was well answered and most candidates could apply the principle of natural selection to chuckwallas.

Question 4

- (a) Candidates were asked to name four structures shown in a diagram of a plant cell. The majority could select at least three correct names from the given list.
- (b) Most candidates were able to link the structures in plant cells to their functions. Two common misconceptions were that the vacuole is made of cellulose and strengthens a plant cell and that respiration occurs in chloroplasts.
- (c) The transport function of xylem was known by nearly all candidates. Fewer knew the support function of xylem tissue.
- (d)(i) A significant proportion of candidates read the question with insufficient care and gave the answer as phototropism, which was inappropriate as the plant was in the dark. Stronger responses stated gravitropism or geotropism.
 - (ii) Some candidates who answered (d)(i) correctly had difficulty explaining the direction in which the roots would grow and referred to what would happen if the pot was moved. There was allowance made for those candidates who had, incorrectly, stated phototropism in (d)(i) and they were credited here for stating that the roots would grow away from light.

Question 5

- (a) (i) Candidates were presented with the results of a photosynthesis investigation and were asked to describe and explain the results. Very few candidates gave a full explanation. Most candidates gained at least one mark for stating that the rate of release of oxygen increased with an increase in carbon dioxide concentration. A few of the stronger responses stated that this relationship was not linear.
- (ii) The reason for maintaining a constant temperature during the investigation was unclear to many candidates. The majority gave vague answers about the results being more accurate or more precise. Temperature affects the rate of photosynthesis so it must be controlled to ensure that the carbon dioxide concentration is the only variable that changes in the investigation.
- (b) (i) Methane was well-known as an example of a greenhouse gas. Nitrogen was a common incorrect answer.
- (ii) Many candidates knew a test for the presence of carbon dioxide and the positive result. Most candidates chose limewater, with a few naming hydrogencarbonate as the chemical.
- (c) Some candidates read the question with insufficient care and stated the names of different fertilisers. Pesticides, insecticides and herbicides were all acceptable answers.

Question 6

- (a) Candidates were asked to make three correct statements about anaerobic respiration. Most candidates performed well. The least known fact was that enzymes would be involved in anaerobic respiration.
- (b) A small proportion of candidates stated a correct word equation for anaerobic respiration in yeast. The majority included lactic acid in the equation or did not include glucose as a reactant.
- (c) This topic was well-known and most candidates could name three characteristics of living organisms. Incorrect responses included digestion and absorption.

Question 7

- (a) (i) Many candidates had difficulty in naming the blood vessels indicated on the diagram. Of the three, the pulmonary vein was the most well-known. The other two vessels were often identified as artery and vein with no specific name being given.
- (ii) Many candidates could state which blood vessel carried blood with the highest oxygen content. This indicates that they appreciated the function of the system, even if they did not know the names of the vessels.
- (b) This question asked for three structural differences between arteries and veins. Many candidates did not read the question carefully and wrote about functional differences rather than structural differences. Few candidates mentioned the presence or absence of valves.
- (c) (i) Few candidates could state two functions of white blood cells. Many responses were imprecise and used unscientific terminology such as defending the body, fighting bacteria or helping with immunity.
- (ii) The components of blood were well-known; with red blood cells, plasma and platelets all correctly stated.

Question 8

- (a) (i) and (ii) Almost all candidates extracted the required information from the table.
- (b) The majority of candidates were unsure about what happened to the uterus lining during specific days of the menstrual cycle. Many answers incorrectly stated that menstruation occurred during days 8 to 14.

- (c) The fact that an ovum is released from the ovary on day 14 was not well-known by candidates. There were many misconceptions, such as, an ovule was released, the ovary burst apart and the ovary passed down the oviduct.
- (d) Some candidates could not name the hormone that causes the development of secondary sexual characteristics in boys as testosterone. Some variation in spelling was allowed, provided it could not be confused with another scientific term.
- (e) Candidates were asked to state two physical changes that occur in both males and females during puberty. A large number of candidates stated changes which occurred in one sex only, and others referred to psychological changes.

BIOLOGY

Paper 0610/42
Theory (Extended)

Key messages

There were some instances where candidates did not provide a correct response as they had misinterpreted the command word at the start of the question. It is important that candidates understand the meaning of each command word so they know what is expected from them in their responses. This was particularly evident in **Question 4(d)(ii)** where a number of candidates described the data rather than explaining the data.

Candidates would benefit from practising the key skill of interpreting data from graphs. Candidates should be encouraged to use the axes labels as a guide to understanding the information contained within a graph and pay close attention to any keys. Using this information would have helped some candidates to give better responses in **Questions 4(d)(ii), 5(a)(i) and 5(a)(ii)**.

Candidates should give the number of responses required by the question. For instance, **Questions 2(b) and 5(b)(i)** only required two answers to be given.

General comments

A high standard of scientific knowledge and understanding was displayed by many candidates. Occasionally, the spelling of scientific terms caused difficulties.

Candidates should be reminded to read the stimulus material in each question carefully, complete all the instructions contained within the question and to omit scientifically correct but irrelevant information.

Some areas of the syllabus were better known than others.

Comments on specific questions

Question 1

- (a) The hormones produced by different endocrine glands were reasonably well-known. Some candidates had difficulties with spelling of the hormone testosterone. Some common misconceptions included identifying the pancreas as the liver and the adrenal glands as the adrenaline gland.
- (b)(i) Where candidates identified hormone **A** as oestrogen, they generally linked it to the role of thickening of the uterus lining. Fewer candidates described the other roles of oestrogen, for example, the effect on secretion of other hormones. Occasionally the hormone was misidentified as FSH.
- (ii) This question did not pose any issues for candidates with many giving a correct day.
- (iii) This question proved demanding. Common errors included only giving day 6 rather than the range of days over which the uterus lining is shed. Some candidates omitted day 0 in their range of days given.
- (c)(i) There was some confusion between the contraceptive pill and the pill that causes termination of pregnancy. It was evident that there were many misconceptions about the effects of the contraceptive pill. Some candidates gave the physical side effects of the contraceptive pill rather

than discussing social implications. When the social implications of the use of the pill were described, the negative aspects tended to be highlighted. Few candidates discussed the positive benefits such as fewer unplanned pregnancies and the increase of women in education. The most common response was a reference to a decrease in birth rate.

- (ii) This part of the syllabus was not well-known. There was confusion between the impacts of contraceptive hormones in the water and the impacts of other water pollutants.
- (iii) This question was generally answered well with most candidates giving two correct examples of barrier methods of contraception. Occasionally candidates confused barrier methods with surgical methods.

Question 2

- (a)(i) The question asked for a visible feature. Correct responses generally referred to the presence of a plasmid or a loop of DNA.
- (ii) The majority of candidates could answer this question correctly with the most common correct response being cell membrane.
- (b) Many correct responses were seen. The terms used in the syllabus should be the terms used in responses. Some incorrect responses of Monera and viruses were seen. Occasionally the names of various phyla or classes were given rather than kingdoms.
- (c)(i) There were many excellent, detailed and accurate descriptions of the nitrogen cycle. Many candidates were aware of the processes occurring in each part of the cycle and were able to express this clearly. Occasionally candidates simply repeated the information in the diagram without adding any additional detail. Nearly all candidates followed the instructions carefully and included information on processes **A**, **B** and **C** in their responses. Some candidates omitted the necessary details, such as the conversion of proteins to ammonium ions and deamination.
- (ii) Occasionally, some candidates gave nitrification or another process in the nitrogen cycle. However, the majority gave the correct response of active transport or diffusion. A few candidates gave the incorrect response of osmosis.

Question 3

- (a)(i) A high proportion of candidates were able to estimate the resting heart rate from the ECG trace. Several were able to calculate the time taken for one beat, but were unable to convert this to the correct heart rate. Some responses contained rounding errors.
- (ii) Explanations of the difference between the ECG traces during exercise and at rest were well done with a large proportion of candidates obtaining full marks. Most realised that the heart rate increased, but weaker responses only related it to a demand for extra energy or oxygen without also connecting this to respiration and muscle contraction. Candidates should be reminded that the process of respiration releases energy and does not produce energy. Some candidates went into some detail about anaerobic respiration; while this was scientifically accurate, it was irrelevant in this context.
- (iii) Most candidates gave a correct method of monitoring the activity of the heart. Very occasionally some incorrectly suggested that monitoring breathing rate would be a suitable method.
- (b)(i) Candidates displayed good knowledge on the formation of an oxygen debt with many identifying the build-up of lactic acid in the muscles. Some candidates gave the incorrect product of carbon dioxide rather than lactic acid.
- (ii) In outlining how the body removes an oxygen debt, few candidates mentioned that the breathing rate and heart rate remain high, most stating that both increased. The fact that lactic acid is broken down in the liver was generally well-known. Fewer candidates were able to explain the role of aerobic respiration in the process. However, there were many good responses with a many responses gaining the maximum credit available.

Question 4

- (a) The definition of an organ was generally well-known. Occasionally, responses described an organ as a group of cells rather than tissues or omitted part of the definition.
- (b)(i) The majority of candidates were able to identify the upper epidermis with the most frequent incorrect answer being the cuticle.
- (ii) Candidates had more difficulty identifying the vascular bundle with several incorrect references to xylem or mesophyll.
- (iii) Candidates had a good understanding of the adaptations of the palisade layer. There was sometimes confusion between the adaptations of the leaf and the adaptations of the palisade layer. Some candidates talked generally about leaf adaptations. A common misconception was to refer to the tissue being tightly packed rather than the cells within the palisade layer being tightly packed.
- (c)(i) It was clear that some candidates confused the transport role of the xylem with the phloem.
- (ii) Candidates found it very challenging to express their ideas clearly. Many had some idea that part of the plant was a source in the summer and a sink in the winter, but could not explain any further. Some discussed the transport of water and mineral ions rather than the products of photosynthesis or stored starch. Partial credit was awarded to some candidates for explaining that the leaves photosynthesise and are therefore a source. Fewer could explain why leaves are also a sink.
- (d)(i) This was another question that candidates found demanding. Some candidates unsuccessfully tried to explain in terms of limiting factors. Better responses gained credit for the idea that oxygen was used in respiration by the plant.
- (ii) Many candidates did not interpret the meaning of the command word correctly and gave a description rather than an explanation of the results. Few candidates explained that carbon dioxide was the factor limiting the rate of photosynthesis initially. More candidates recognised that factors such as light intensity or temperature could be limiting the rate of photosynthesis when the graph had reached a plateau.
- (e) Most candidates realised that a decrease in temperature would cause a decrease in the rate of photosynthesis. There were some inaccuracies in some of the lines drawn, with some showing the same gradient or a plateau at the same level as the original line.

Question 5

- (a)(i) Most candidates were able to calculate a correct percentage change.
- (ii) Many of the candidates were able to give a reasonable description of the data. Fewer were able to make the link between vaccination rates and corresponding changes to the number of cases of measles. Occasionally there were some inaccuracies in reading values from the graph. Candidates should be encouraged to state values precisely rather than give approximate values. Occasionally candidates did not describe the results in their entirety, often only describing the increase in vaccination rates and decrease in number of cases of measles without referring to the later fluctuation in vaccination rates and the plateau of number of cases of measles.
- (iii) Generally, candidates displayed a good knowledge of how vaccination works. Occasionally there was some confusion between the terms antigen, antibiotics and antibodies.
- (b)(i) Chemical barriers to pathogens were well-known. Although the incorrect responses of lymphocytes and phagocytes were frequently seen.
- (ii) There were some excellent detailed descriptions of blood clotting using correct terminology. Very occasionally candidates confused fibrin and fibrinogen and a minority had issues with correct spelling.

Question 6

- (a)(i) Candidates had little difficulty in identifying the correct number of trophic levels. A few candidates did not understand the meaning of the term trophic level and gave the number of organisms in the food web.
- (ii) Candidates generally gave the correct response for this question. Very occasionally candidates provided the names of organisms that were not in the food web diagram, despite being instructed to use Fig. 6.1.
- (iii) This question was answered well, with most candidates recognising that chemical energy was involved. Incorrect responses of kinetic energy or heat energy were occasionally seen.
- (b) The best responses described the 10% theory of energy transfer between trophic levels to explain why the total biomass of the snakes in trophic level three was less than that of the mice in level two. Many candidates were able to describe how the energy was lost between trophic levels. The best responses also included the explanation that snakes were one level above the mice and that there was insufficient energy to sustain a large biomass of snakes. Several weaker answers simply referred to the fact that snakes need to consume many mice without explaining the energy link.
- (c) In describing how drought can contribute to famine it was clear that a few candidates were unaware of the meaning of the term drought. Many candidates did understand the phenomenon and described the effect of drought on crops. Some candidates simply referred to animals and plants and the effect of the lack of water on food chains and biodiversity, which was not required in the context of the question.

BIOLOGY

Paper 0610/52
Practical Test

Key messages

When planning investigations, candidates should use the same principles each time. They should describe the independent variable, the dependent variable and the variables that are kept constant. Then they should describe the method, including general procedures such as repeating the investigation more than two times and naming suitable safety procedures.

Sufficient practice is needed with choosing suitable scales for graphs and accurately plotting data points.

General comments

Many candidates displayed good skills in drawing biological specimens and recording results in a table.

In mathematical questions, it is important that candidates show their working so credit can be awarded for their method even if the final answer is incorrect.

Comments on specific questions

Question 1

- (a) (i) Many candidates were awarded full marks for drawing the table and recording their data. In some cases, candidates omitted suitable headings or units. It is important that candidates do not include units in the body of the table.
- (ii) In this question, candidates were asked to calculate the change in distance from the knot to the meniscus after 15 minutes. Some candidates misinterpreted the question and wrote the last value or omitted to calculate the difference correctly. Another common error was to incorrectly convert cm to mm.
- (iii) Most candidates were able to identify that in order to calculate the difference accurately, they need to take measurements from the same place on the dialysis tubing bag.
- (iv) For this question, any valid conclusion using the candidate's results was accepted. Most were accurately able to identify a trend in the data they collected.
- (v) Some candidates found it challenging to identify the dependent variable. The most common error was listing a number of control variables or naming temperature as the dependent variable. It is important that candidates practice the skills needed to identify the different variables in experiments.
- (b) (i) This question was answered well by candidates. They were able to clearly describe the idea that there would be contamination in the dialysis tubing if the same syringe was used for the different solutions. Stronger responses went on to state that this could change the results obtained or discussed how the results might be affected.
- (ii) This question assessed whether candidates understood why collecting several sets of results is better than just collecting one set of results. A few candidates were able to correctly state that it allows anomalous results to be identified, but by far the most common accepted response was so that a mean value could be calculated. Candidates need to be careful to distinguish between not



having anomalies and identifying anomalies to be removed. Quite a few candidates stated that by having a large number of results, there would be no anomalies, which is incorrect.

- (c) (i) Candidates were more confident when identifying the variables that were kept constant. It is important that candidates ensure they read the question carefully to ensure they are answering accurately what is asked of them. The temperature was not explicitly controlled, so could not be accepted. Many candidates were able to identify the (initial) length of the potato cylinders as being an important variable to keep constant; the soaking time was also a common correct response.
- (ii) Almost all candidates were able to calculate the percentage change in mass. A few candidates did not round their answers to one decimal place as instructed in the question.
- (iii) The vast majority of candidates were able to draw a suitable graph. The most common error was not providing suitable units for the axes or drawing incorrect lines of best fit. It is important that lines of best fit are not extrapolated beyond the plotted points.
- (iv) Many candidates were able to accurately identify the value at which there was no percentage change in mass. Some candidates misread the value due to difficult scales being used on the x-axis.
- (v) Some candidates were able to explain why percentage change in mass was more useful than change in mass. Many gave vague statements that could not be credited. Using percentage change allows direct comparison because it takes different initial masses into account.
- (d) It was clear that ~~pupils-candidates~~ were familiar with the starch test and correctly named iodine as the test solution and described a change to a blue-black colour for a positive result.

Question 2

- (a) (i) The standard of the drawing for the cut tomato fruit was high. Many provided an accurate drawing of a suitable size with 6–10 seeds on each side. The most common error was to shade the seeds or not show the edge of the fruit correctly.
- (ii) Candidates were often unsure of the test for vitamin C. The first marking point focused on the idea that the fruit needed to be processed. The juice could be extracted or the fruit cut and a sample removed. In order for candidates to access the second marking point, they needed to correctly name the reagent as DCPIP. Even if candidates could not name DCPIP, they could still be awarded the third marking point by stating that it would go colourless.
- (b) Most candidates correctly measured the length of the given line on the photomicrograph. Many were then able to divide this value by the magnification and express this using a suitable unit.
- (c) For this planning question, candidates were asked to describe a method that students could use to find the optimum temperature for the germination of seeds. Many candidates found this question particularly challenging as few seemed familiar with this topic. Some wrote about how to carry out photosynthesis investigations rather than germination. Some candidates were able to correctly identify a suitable temperature range in which to complete their investigation. Many were able to identify some variables that should be kept constant, such as the volume of water and the type of seed.

BIOLOGY

Paper 0610/62
Alternative to Practical

Key messages

Candidates are advised to practise drawing tables. It is important to use detailed column headings and only to include units in the column header and not in the body of the table.

Candidates are encouraged to show their working for all calculations. This ensures that some credit can be awarded if the final answer is incorrect.

Candidates are advised to practise food tests to avoid confusing the different procedures and expected positive results.

Candidates would benefit from reading through the plans they design to investigate a hypothesis. Additional details, such as the number of repeats or temperatures, should be clear and concise.

General comments

Graph plotting skills were generally good, despite the additional challenge of both positive and negative scales required on the y-axis in **1(d)(iii)**.

There were many excellent drawings which showed careful attention to detail.

Most candidates were also able to measure lengths carefully in **Question 1(a)(i)** and **Question 2(b)**, though many were less confident about which units to use and how to record them. Many detailed plans were seen but some candidates still find it challenging to know which variables to control and which variable to change, with temperature often featuring in both categories in **Question 2(c)**.

Comments on specific questions

Question 1

- (a) (i)** Almost all candidates were able to draw a table with an appropriate number of rows and columns and many also included suitable column headings. Candidates should be advised that each row and column should be associated with one parameter only and that this should be labelled unambiguously. Units should be in the table headings, not in the body of the table. Although most candidates gave measurements in the expected range, some did not read the question carefully and measured the bottom of the bag from the wrong point.
- (ii)** Some candidates did not give their answers in millimetres or converted incorrectly from centimetres. Care should always be taken when converting between units.
- (iii)** Many candidates could explain why it was important to take the measurements from the same place on the dialysis tubing bags.
- (iv)** Fewer candidates were able to state a conclusion. Although many excellent answers were seen, a significant proportion gave a description of the results rather than a conclusion.

- (v) There were a number of correct ways to express the independent variable for this investigation. Some candidates did not gain credit because they didn't give sufficient detail, for example stating just 'solution', rather than saying where the solution was (in the dialysis tubing). Many incorrectly stated that the volume was changing.
- (vi) Most candidates knew the reason for collecting several sets of results. Some responses were too vague and didn't clearly explain that repeats allow anomalous results to be identified.
- (b) Most candidates knew that the washing step was to prevent sucrose on the syringe from mixing with the contents of bag **DW**. This was expressed in a wide variety of ways although a minority of candidates only repeated that the syringe was not washed and did not extend their answers to describe the idea of contamination.
- (c) Almost all candidates were familiar with the Benedict's test, but a number forgot the heating stage and others referred to a water-bath without clarifying that heat was used. A small number of candidates incorrectly described the biuret test instead.
- (d) (i) Many candidates were able to identify two variables that were kept constant in the potato osmosis investigation. Mass was a common wrong answer, despite the masses being different when looking at the data. Others incorrectly stated temperature, even though there was no mention of this variable in the procedure.
 - (ii) Almost all candidates were able to calculate the percentage change in mass, suggesting that most candidates checked their working against the other data in the table. A few candidates did not round their answers to one decimal place as instructed in the question.
 - (iii) The line graph was generally well drawn with nearly all candidates plotting the data correctly. The size of the plot points were sometimes too large to be able to award the mark because they filled more than a whole small square. A few candidates forgot the axis labels, and a few chose scales that made plotting difficult. Extrapolation beyond the last point remains a common error. A few candidates used different scales for negative and positive percentage changes in mass.
 - (iv) Most candidates were able to read the value at the point where their line intersected the x-axis.
 - (v) Some candidates were able to explain why percentage change in mass was more useful than change in mass. Many gave vague statements that could not be credited. Using percentage change allows direct comparison because it takes different initial masses into account.
- (e) Most candidates were able to name the test for starch. A very small number stated starch instead of iodine, or blue instead of blue-black.

Question 2

- (a) (i) The quality of the drawings was generally very good with many candidates gaining full credit. The outlines were usually drawn with a smooth, unbroken line, but a few were feathery. A few candidates drew an incorrect number of seeds (5 and 11 being commonly seen). Attention to detail is essential for this skill.
 - (ii) Many candidates were familiar with the test for vitamin C although quite a few could not recall DCPIP. Others seemed not to know of the DCPIP test and instead suggested tasting the fruit, using it to cure scurvy, or testing the pH (recognising that vitamin C / ascorbic acid is acidic). Stronger responses also recognised that a sample of the tomato needed to be taken before testing.
- (b) Almost every candidate was able to correctly measure the length of line **PQ**. A few candidates attempted to convert to micrometres, often resulting in an incorrect answer. Others forgot to include units in their answers.
- (c) Many detailed and carefully planned investigations were described with many gaining full credit. Commonly candidates described a number of different temperatures, and often how they would maintain those temperatures, for the course of the investigation. However, a common error was to describe the use of a range of environmental conditions to test seed germination, but these conditions did not directly specify a change of temperature. A few candidates focused on the growth or height of the plant itself rather than germination. Other candidates chose not to measure

germination directly, but rather to determine the respiration rate of the seeds. Commonly these plans did not describe appropriate controlled conditions for seed germination in a range of different temperatures and consequently did not gain maximum credit.