BIOLOGY

Paper 0970/12
Multiple Choice (Core)

There were too few candidates for a meaningful report to be produced.

© 2019

BIOLOGY

Paper 0970/22
Multiple Choice (Extended)

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

General comments

The structure of the leaf was well understood, as was the description of translocation and the process that causes antibiotic resistance in bacteria.

There was some uncertainty about the characteristics of arachnids, the effects of auxin on plant shoots and the fact that the cells produced shortly after fertilisation are stem cells produced by mitosis.

Candidates need to work methodically through information given, such as pie charts or experimental data.

Comments on specific questions

Question 1

Most candidates appreciated that the microorganisms exhibited movement, nutrition and sensitivity.

Question 3

Many candidates correctly appreciated that the arthropod shown was an arachnid. A small proportion of candidates incorrectly thought it was a crustacean.

Question 7

Many candidates appreciated that the reabsorption of glucose by kidney tubules depends on active transport. A minority of candidates incorrectly believed that the uptake of water by plant roots depends on active transport.

Question 12

Carbohydrates, fats and oils all provide energy. Response **B** was chosen by candidates that applied their knowledge and worked methodically through the information in the pie charts.

Question 13

This question proved challenging. Candidates would benefit from recalling that chloride ions are secreted into the lumen of the small intestine as a result of the toxin produced by cholera bacteria.

Question 15

Candidates would benefit from being more methodical when working through practical problems. Some candidates did not appreciate that the uncovered plant would lose water to its surroundings and therefore lose mass.

Question 16

This question was well answered by the majority of candidates. A small proportion of candidates incorrectly thought that the transported sugar in plants is glucose.

Question 19

Interpreting the diagram proved problematic for many candidates. The most common error was candidates incorrectly identifying P as the alveolus wall. The alveolus wall was represented by Q.

Question 21

Many candidates appreciated that during the recovery from vigorous activity aerobic respiration of lactic acid takes place in the liver. Some candidates incorrectly believed that anaerobic respiration of lactic acid in the muscles takes place.

Question 22

Many candidates appreciated that the process that transmits an impulse across a synapse is diffusion. A small proportion of candidates incorrectly thought that the process was active transport.

Question 26

Many candidates were able to correctly identify the factors that contribute to the development of antibiotic resistance. Some candidates incorrectly believed that artificial selection was one such factor.

Question 30

This proved to be a challenging question. Many candidates did not appreciate that the cells produced shortly after fertilisation are stem cells and they are produced by mitosis.

Question 33

Many candidates appreciated that some xerophytes have leaves that are rolled up and are covered with hairs.

Cambridge Assessment
International Education

Question 36

Many candidates were able to correctly identify where denitrification occurs in the nitrogen cycle.

Question 38

Candidates would benefit from recalling the chemical reaction catalysed by maltase. When a maltose molecule is hydrolysed by maltase, two glucose molecules are released.

BIOLOGY

Paper 0970/32
Theory (Core)

There were too few candidates for a meaningful report to be produced.

BIOLOGY

```
Paper 0970/42
Theory (Extended)
```

Key messages

Candidates need to appreciate that when quoting data, answers must include units. In **Question 4 (d)(ii)** many candidates did not use the correct unit for the death rates. Many candidates used the same scale to take figures for percentage smoking and death rates so gave the latter as percentages rather than as deaths per 100 000.

Where candidates are asked to explain or describe, maximum marks can best be obtained by identifying relevant points and giving a detailed and logical account. Responses that are presented as bullet points often lack sufficient detail.

It is important that candidates read each question and any accompanying stimulus material carefully and complete all the instructions contained within the question. This was particularly important in **Question 2 (a)** and **Question 3 (e)**.

There are many definitions given in the syllabus. Candidates should be encouraged to learn definitions as it is important to phrase answers close to those given in the syllabus.

General comments

Candidates generally responded with well written answers that showed a good understanding of topics from across the syllabus.

Some candidates misinterpreted the command words. Candidates would benefit from understanding the type of response that is expected from each command word, particularly describe and explain.

Comments on specific questions

Question 1

(a) (i)   Many candidates gave two suitable features common to all arthropods, such as segmented bodies, jointed legs and an exoskeleton. Not all arthropods have antennae.

   (ii)   Candidates had to give two features to complete the key to the arthropods shown in Fig. 1.1. Typical answers for box 2 included the insect features of three pairs of legs and wings. Candidates often gave incorrect features in box 3 such as compound eyes. Many, however, correctly stated that arthropod **A** has claws of different sizes.

(b) (i)   Most candidates gave four pairs of legs as the feature shown by the happy-faced spider that identifies it as an arachnid. Some stated that the head and thorax are fused together or used the term cephalothorax. A few gave pedipalps as the feature.

   (ii)   Some candidates gave good accounts of adaptive features as applied to the happy-face spider. These candidates clearly knew the definition of the term from the syllabus. However, many candidates described features other than the pattern on the bodies of the spiders in their explanation. Those that did write about the face pattern often referred to camouflage, warning to predators and lures for prey.

(c) Some candidates simply explained where to find DNA either in cells or on the spider webs. Others explained how to cut particular lengths of DNA from the samples collected from the spider webs thinking that this was a question about genetic engineering. Strong responses started with the base sequences in DNA from unknown sources should be compared to known sequences. Many candidates had the idea that the base sequence in DNA is unique to each species. Some candidates quoted the syllabus statement that organisms which are more closely related have base sequences that are more similar than those that share only a distant ancestor. An occasional error was to confuse DNA with protein structure and to state that DNA is composed of a sequence of amino acids. Some candidates referred to base pairs instead of base sequences.

(d) Many candidates gave three different reasons why species become endangered. Some candidates focused entirely on spiders and gave three variants on the hunting-collecting idea. Common acceptable answers were the use of pesticides, habitat loss, increases in predators and increase in competition for food. Some candidates thought that the large-scale removal of spiders from their environment for sale to tourists or for research work in laboratories were responsible.

Question 2

(a) Most candidates answered this question, although some only completed one of the two tasks. Many circled a complete vascular bundle enclosing the xylem, phloem and outer area of sclerenchyma (fibres). Circles that did not include the fibrous area were accepted, but they had to enclose the whole of the xylem and phloem.

(b) Candidates who realised that the cells in area **Y** of the stem are living cells that absorb water by osmosis and are turgid tended to gain maximum marks. Many candidates thought that **Y** was pointing to the xylem or phloem and described the movement of substances within those tissues, or they thought that the cell walls of the cells were lignified to provide support.

(c) Most candidates gave good descriptions of the data in Fig. 2.3 and Table 2.1 explaining that removal of the phloem prevented translocation of the labelled sucrose or that sucrose was only translocated when phloem was left intact. Very few answers referred to the leaf as the source of the sucrose or the shoot tips and roots as the sinks. Weaker answers stated that the movement of minerals occurred in the phloem from roots to shoots and made little reference to the information about sucrose given in the question. Only the strongest answers stated that sucrose moves in both directions in the stem.

Question 3

(a) (i) Many candidates identified the correct roles of hydrochloric acid. A few candidates thought that the acid was responsible for chemical digestion.

(ii) Most candidates stated that pepsin is the enzyme that breaks down protein in the stomach. The products of the action of pepsin were given as polypeptides, peptides and amino acids. Some stated that pepsin is a protease without any further detail so did not gain credit. Others confused pepsin with lipase or with amylase.

(b) Candidates were less successful with the definition of assimilation. Many confused this with mechanical digestion, chemical digestion or absorption. Those that knew assimilation follows absorption rarely stated that nutrients that were formed by digestion move into cells where they become part of the cells. Examples were not required, but some candidates did support their definition by giving the example of protein synthesis. Some candidates thought that assimilation was the distribution of food molecules through the body in the blood.

(c) Many candidates thought that stem cells provide defence against stomach acid. Few seemed to know the role of stem cells as described in **section 17** of the syllabus. Strong responses referred to stem cells as unspecialised cells that divide by mitosis to produce cells that specialise to replace cells damaged by the acid contents of the stomach. Stem cells do not repair damaged cells as some candidates thought.

(d) The role of the microvilli in increasing the surface area of the villi in the small intestine for absorption was well known. A common misconception was that microvilli help to move food along the intestines.

(e) There were many correct answers, but many candidates rounded up their answers to one decimal place rather than to the nearest whole number. Common errors included:

misreading the figures from the graph

using 120 as the denominator in the calculation rather than 78

dividing 78 by 120 instead of dividing the increase in number (42) by 78.

Question 4

(a) There were many good accounts of the ways in which the human gas exchange system is protected against pathogens. Many answers included the roles of nasal hairs, goblet cells, mucus and cilia. A common misconception was that cilia trap bacteria, rather than move bacteria trapped in mucus. Few candidates classified the protection measures they described as mechanical or chemical barriers. Some candidates described the action of phagocytes in the lungs, although some just referred to them without describing their action in engulfing pathogens.

(b) Well-prepared candidates wrote excellent answers to this question on vaccination. Strong responses explained that vaccines contain dead or weakened forms of the pathogen which stimulates active immunity. Candidates explained that some lymphocytes release antibodies and some develop into memory cells that are responsible for the fast response if the live pathogen enters the body in the future. Some candidates used the terms immune response and antigen correctly in their answers and explained that memory cells are long-lived or are responsible for the long-term nature of active immunity. Weak responses often showed knowledge of the events that follow injection of a vaccine, but did not use the correct terminology or included misconceptions.

(c) Most candidates could not give two appropriate reasons why antibiotics cannot be used to treat viral infections. Only the strongest candidates stated that antibiotics are effective against bacteria, but viruses do not have any of the structures or processes that are targeted by these drugs. Common correct answers were that viruses are not alive and that they do not have cell walls. Some candidates also stated that viruses infect the cells of their hosts so that they are beyond the reach of antibiotics that cannot cross cell membranes.

(d) (i) In this data response question, candidates were asked to describe the differences between the percentages of males and females that smoke in country **A**. Many candidates described the changes in the percentages in the two groups without stating any differences between them. Most of the successful answers stated the percentage of males that smoke is higher than the percentage of females, that the peak for males occurred earlier than for females and that the increase in the percentage of males smoking early in the twentieth century occurred faster and, later in the century, the decrease occurred faster than in females. Many answers included suitable data quotes with year(s) and percentages for both groups. Some candidates did not read the question carefully and also wrote about death rates.

(ii) This proved to be a challenging question as many candidates did not identify any trends in their answers. Good answers agreed with the statement using evidence from country **A** in Fig. 4.1. They identified the increase and decrease in percentage smoking in both groups and the same trend repeated in the deaths from lung cancer. Some also noticed that the peaks occurred some years apart. The same trends are not visible in country **B** as no data is included for the years before 1950. Some candidates noticed that while the percentage of male smokers decreased steeply from that date, the numbers of female smokers did not and fluctuated from year to year. Also, the number of deaths in men increased from 1950 but the number of deaths in females did not. Confusion often occurred as a result of candidates not specifying the country they were referring to, or comparing males from each country rather than the trends within each country and the pattern between male and female. Some candidates just quoted data from different points in the graphs, but did not describe any trends. Many candidates gave the death rates as percentages taking them from the axis on the left rather than the axis on the right. Some used the same scale to make comparisons saying that more men or women die from lung cancer than smoke.

Question 5

(a) (i) Candidates who based their answers simply on their knowledge of wind-pollinated flowers tended to score less well than those who read the question and based their answers on the flower shown in Fig. 5.1. Points about pollen grains, colour, scent and absence of features associated with insect

pollination did not gain any credit. Strong responses referred to the position of anthers and stigma, the feathery structure of the stigma and the small bracts. Some candidates used the letters from Fig. 5.1 in their answers, but some did not identify the structures correctly. For example, the stigma was often identified as pollen.

(ii) Most candidates gave a correct answer. A common incorrect answer was **D**.

(b) Many candidates appeared to assume this question was about asexual reproduction in plants rather than sexual reproduction involving self-pollination. Some made this explicit by stating that the plants split into two. Few candidates gave positive aspects of self-pollination, such as the little wastage of pollen and the independence from pollinators. Some candidates wrote about dispersal of seeds rather than the transfer of pollen grains. Quite a few candidates referred to plants being genetically identical, rather than having little variation, which suggests asexual reproduction. There were quite a few vague references to disease or being unable to survive or adapt to changes in the environment.

(c) Candidates identified most of the factors that have the potential to cause famines.

(d)(i) Many answers simply repeated the steps already outlined in Fig. 5.2 to suggest how the plant breeders made sure that the plants that they used for step 3 were rust-resistant. Stronger responses stated that the plants could be exposed to the rust fungus to see if they become infected. Candidates rarely stated that the plants that were not infected, did not show any symptoms or showed resistance would be the ones chosen for step 3. Perhaps prompted by **Question 1** candidates suggested that the DNA of the plants could be tested for the appropriate gene.

(ii) Candidates often missed the fact that step 3 is repeated for many generations to increase the number of plants that will become available for supply to farmers. Other ideas that candidates suggested included ensuring that all the plants are resistant to stem rust and to make sure that they are all homozygous for the gene concerned.

(e) Candidates gave a variety of features of monocotyledons including one seed leaf or cotyledon, narrow leaves, parallel veins and flower parts in threes. Monocotyledons do not have one seed.

Question 6

(a) Many candidates completed the table correctly. The most common incorrect responses were for **C** and **D**. These were often given as decomposition for both **C** (respiration) and **D** (fossilisation). Some candidates gave formation of fossil fuels for **D** and that was accepted.

(b) Candidates had to complete the passage with six words or phrases. Sources of methane proved difficult for candidates to state accurately. The expected sources were cattle, flooded rice fields, swamps or marshes, rubbish tips and landfill. Many candidates gave combustion or burning which was not accepted. As with sources of methane a variety of answers were accepted for the final gap. The expected answer was non-biodegradable, but micro, single-use and non-recyclable were accepted. These answers showed an awareness of current concerns over the widespread use of plastics and their damage to the environment.

BIOLOGY

Paper 0970/52
Practical Test

There were too few candidates for a meaningful report to be produced.

BIOLOGY

<div style="border:1px solid black">

Paper 0970/62
Alternative to Practical

</div>

Key messages

Candidates would benefit from knowing the reagents to use in food tests, how to carry out the tests and the colours which denote a positive result.

Candidates should try to match the detail they give to the number of marks available. For example, a three-mark question will require the candidate to make three separate points.

General comments

There were many excellent responses demonstrating that the candidates had sound practical skills and an understanding of the processes involved. The majority of candidates read the questions thoughtfully and attempted to carry out their requirements.

Comments on specific questions

Question 1

In this question, candidates were introduced to a simple investigation involving the action of amylase on starch. The amylase and starch were placed inside a bag made from dialysis tubing and the temperature maintained. A control investigation with water replacing amylase was also described. After ten minutes, tests were carried out for the presence of starch and reducing sugar.

(a)   The majority of candidates named iodine solution as the chemical used to detect the presence of starch. A small proportion incorrectly named Benedict's solution.

(b)   Candidates were asked to describe a test for reducing sugars. The majority of candidates knew that Benedict's solution should be used but many neglected to state that heating is necessary. Many candidates could not be awarded the heating mark as they put the test-tube in a water-bath; this is insufficient as a water-bath could be cold, so a hot water-bath had to be specified.

(c)   Washing the dialysis bag removes any starch suspension or amylase solution which has been spilt whilst the bag is being filled. Vague answers, such as 'to clean the tubing' insufficient as there was no indication of what substance might be removed.

(d) (i)   Candidates were required to construct a table and use it to record the results of the investigation. Most candidates could construct an adequate table and record the results accurately. The selection of adequate headings for the table proved more challenging.

    (ii)   Writing conclusions was challenging for many candidates. Stronger responses stated overall conclusions such as, 'amylase breaks down starch but water does not' or 'reducing sugar can diffuse through dialysis tubing whereas starch cannot as the molecules are too large'. The majority of candidates gave more simplistic answers stating where starch and reducing sugar were present or absent.

(e)   Of the many variables that were kept constant during the investigation, most candidates could state two. Weaker responses were often too vague and lacked adequate detail.

(f)   Most candidates were awarded the marks for describing two method points from the previous investigation, plus stating that a range of temperatures should be used. Many could state a safety feature, such as the use of gloves or safety glasses. Points that were rarely mentioned were using a thermostatically controlled water-bath, using the same concentrations of starch suspension and amylase solution, timing how long the reactions took, performing each temperature at separate times, maintaining the same pH and equilibrating the temperatures of the solutions prior to starting the investigation.

It should be noted that using known volumes of substances is not the same as using the same volumes of these substances: the volumes may be known, but not necessarily identical.

(g)   Many candidates knew that biuret reagent is used to test for the presence of protein and that the positive result is a mauve-purple colour.

Some candidates, having named biuret reagent, went on to state the chemicals involved. This is not required, and in those cases where incorrect chemicals were named, the mark for biuret could not be awarded.

Question 2

(a)(i)   The majority of candidates could measure the width of the leaves within the accuracy required. A few candidates gave measurements in centimetres or entered them in an incorrect sequence.

(ii)   Most candidates successfully calculated the average. Errors made in the measurements in **(a)(i)** were carried forward, so that a mark was awarded where a correct average was calculated from incorrect figures.

(iii)   Some excellent bar charts were produced. Those who did not gain full marks usually gave an incomplete label on the *y*-axis, for instance labelling the axis as width rather than average leaf width in mm. A few candidates drew a line graph or left no gaps between the bars.

(iv)   Most candidates could identify the anomalous result as 12, and went on to explain why this could be considered anomalous. Some candidates made the correct selection, but then had difficulty expressing why they had chosen it.

(b)(i)   The majority of candidates could state that light intensity was the variable that was changed. Some candidates gave imprecise answers, such as light rather than light intensity.

(ii)   The majority of candidates could state that the width of leaves was the variable that was measured. Some candidates gave imprecise answers, such as size of leaf, and could not be credited.

(c)(i)   Candidates were asked to make a drawing of a cross-section of a root. Some drawings were excellent. Most candidates drew diagrams that were sufficiently large and many gained at least one of the detail marks. The line quality was generally good except for the large central xylem vessels, which were often drawn randomly. Candidates should draw in pencil and use an eraser where necessary.

(ii)   The measurement was usually accurate and the magnification calculated correctly. Common errors were measuring the original line in centimetres, dividing by 2.2 and giving a unit for magnification.

(iii)   This question proved to be challenging. Many candidates found it difficult to select, and express clearly, two differences between the structures of the root and stem. A number of candidates drew on their theoretical knowledge and stated differences that were not visible in the photomicrograph.

(d)(i)   Candidates appeared to be unfamiliar with the technique of tracing round a leaf on gridded paper to find its area. The commonest method suggested by candidates was to measure the width and length of the leaf and multiply these figures to find the area. As leaves have an irregular shape, this is not appropriate. Of those who described using a grid, many forgot to say that the leaf shape had to be drawn on the grid, or that the occupied squares had to be counted. Alternative methods were given credit, such as, using a transparent grid, or taking a photograph of a leaf and then using an app to find the area.

(ii)   Most candidates realised that leaves are of variable length so measuring area is better than width.