

BIOLOGY

Paper 0438/11
Multiple Choice

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

General comments

The paper worked well to provide a meaningful challenge to candidates at this level. The most challenging questions served to expose some underlying uncertainties in candidates' minds, and, otherwise, all questions made a significant contribution to discriminating between candidates of differing abilities.

Comments on Specific Questions

Question 1

Most candidates answered this question correctly. However, some selected photosynthesis as the answer showing a misunderstanding of the process involved.

Question 6

Plant cell structure posed few problems for candidates. The presence of a cell wall in both diagrams was recognised by all candidates and with nearly all recognising chloroplasts in one cell and not in the other.

Question 9

The reference to transport as a function of xylem, appears to have been a distraction from the fact that the xylem is a tissue and not an organ. Some candidates therefore missed the fact that the xylem is a tissue used for support.

Question 11

This question proved challenging as many overlooked the fact that absorption in the ileum will occur by diffusion and that there is no form of gas exchange occurring in the bronchioles.

Question 12

Candidates should remember that digestion occurring in the stomach does so in strongly acidic conditions. Clearly they knew that enzymes are not sugars, but some also believed that *all of them* are most effective at pH7.

Question 15

This proved to be a challenging question as some candidates erroneously believed that the liver produces digestive enzymes.

Question 18

Some candidates showed a good understanding of the function of the phloem.

Question 22

Accommodation proved to be a particularly challenging concept for many candidates.

Question 24

Some candidates were thought that diffusion occurs in the umbilical cord rather than the placenta.

Questions 28 and 37

Were question that demanded the ability to read information from a graph and candidates showed that this is a skill they have mastered with a very high percentage of correct answers seen in both questions.

Question 30

The traditional confusion between meiosis and mitosis was seen, as was an uncertainty over the function of meiosis.

BIOLOGY (US)

Paper 0438/21
Core Theory

Key Messages

A good recall of the definitions of key words, as defined in the syllabus, is essential.

Command words such as “describe”, “explain”, “suggest” and “compare” require different responses from candidates. A “suggest” question encourages the candidate to display biological knowledge linked to the learning outcome being tested.

If a description is required, including a reference to a graph or table, then it will be expected that data will be used in the description given. Many candidates are able to do this effectively. An explanation requires more than just a description and candidates should be encouraged to practise the difference between “explain” and “describe”.

Many candidates had clearly used or referred to past papers when preparing for this examination. It is always useful to practise past papers as some candidates have a good knowledge of biology but are unsure how to express themselves clearly.

General Comments

Candidates were able to complete all sections and there did not seem to be a problem with the time allowed for the paper.

Comments on Specific Questions

Question 1

Candidates showed a good understanding of how to use a key.

Question 2

Candidates need to have a good understanding of the structure and function of the skin and how it responds during thermoregulation.

- (a) Some candidates gave excellent definitions. Many gave a specific definition, relating to maintenance of body temperature, rather than a general one.
- (b)(i) Many were able to identify the hair and the sweat gland but less identified the receptors.
 - (ii) Candidates need to recall that arterioles will have the highest temperature on a cold day.
- (c)(i) This question required a good understanding of how body temperature is lowered by vasodilation. Candidates should recall which vessels are able to dilate and constrict and which cannot, and how this relates to the loss of heat energy.
 - (ii) Many correctly linked sweating to evaporation and heat energy being used to achieve this. Some confused evaporation with transpiration and loss of substances other than water.
 - (iii) Some candidates managed to give one correct answer but few managed two. Some candidates focused on behavioural responses rather than the physiological responses that the answer required.
- (d) A specific organ was required here rather than an organ system.

Question 3

Most candidates showed a good recall of the key word definitions required.

Question 4

- (a) Candidates need to show a clear distinction between the terms growth and development.
- (b) Candidates should only give the number of answers required which in this case was three.

Question 5

- (a) This was well answered and a good knowledge of the male reproductive system shown. Candidates should take care with the spelling of key words. For example, testis and testa, urethra and ureter have similar spellings but are different structures.
- (b)(i) Most candidates correctly identified the location of X.
- (ii) Most candidates correctly stated the reason with only a few incorrectly suggesting prevention of STDs or production of sperm.

Question 6

- (a) Candidates needed to recall the names of the blood vessels to and from the kidney very few were able to do so.
- (b) The majority of candidates scored the mark for water but ions or salts, hormones and vitamins were also credited.
- (c)(i) Urea is formed in the liver. Many candidates knew this information, however, a few wrote kidneys, intestine or pancreas.
- (ii) Many knew that the production of urea was involved in the removal of toxic waste or excess substances but some found it difficult to express themselves clearly.
- (iii) Some candidates seemed to confuse the circulatory and digestive systems.

Question 7

- (a)(i)–
(iv) Many candidates answer these questions well, with some showing only a limited understanding of the carbon cycle.
- (b)(i) This question was answered correctly by most candidates.
- (ii) Candidates need to learn the word equation for aerobic respiration and realise how it differs from photosynthesis.
- (iii) While many candidates know the reactants and products of respiration, less are able to explain the purpose of it. It is also important that candidates understand what the energy released is used for.

Question 8

- (a) Many realised the need for digestion before nutrients can be absorbed and used by the body but few clearly expressed their answers in terms molecules needing to be small enough to be absorbed. Many answers commented about needing to digest food to separate the useful from the unwanted parts.
- (b) This question was generally well answered but sometimes incorrect words were used, e.g. long or thick intestine instead of large, and thin instead of small.
- (c)(i) Most calculated the answer correctly.

- (ii) Careful reading of the question was important and candidates were required to discuss absorption rather than digestion in this question. Some identified that data from the table could be used to support their answer.

Question 9

- (a) This standard definition was known by some candidates. It is important that water vapour is mentioned not just water. Some candidates seem to confuse sweating and transpiration and answered in terms of humans.
- (b) Some candidates answered in terms of the causes of wilting rather than preventing further wilting by changing the environment.

Question 10

- (a) Some candidates described rather than named the phases.
- (b)(i) Some candidates stated the difference but did not go on to explain the difference.
- (ii) Many candidates were able to correctly identify the social implications associated with the size of the human population, but some did not seem familiar with this term from the syllabus.

BIOLOGY

Paper 0438/31
Extended Theory

Key Messages

- Candidates should always pay close attention to the command words in questions, especially when they follow data in the form of graphs and tables. The distinction between describe and explain was not clearly demonstrated by some candidates. This was noticeable in **Question 2**, **Question 4** and **Question 5**.
- The syllabus includes several definitions of key terms. **Questions 1(d)(i)** and **Question 4(a)** asked for definitions of meiosis and tissue respectively. Many candidates gave the syllabus definitions, but many did not. Candidates are advised to revise these definitions thoroughly. Some of these definitions have been revised slightly in the new syllabus.
- The working for calculations should always be shown as credit is given if the answer is incorrect but a key step in the calculation is shown correctly.
- Candidates should be encouraged to use the correct scientific terminology. A number of candidates used terms such as 'messages' for impulses and 'water concentration' when water potential should be used and the 'production of energy' instead of the release or transfer of energy.

General Comments

Candidates generally confined their answers to the permitted space on the paper. This was good to see as, hopefully, this meant that responses were direct and included fewer contradictory statements. It appeared as if all candidates had time to complete the paper.

Negative feedback is a concept that candidates are required to explain. It can be a difficult term to define and to explain without the use of an example. In this paper the role of negative feedback in the control of body temperature was tested. In answering this question it is a good idea to state that the body temperature is kept constant, near constant or within narrow limits. Negative feedback mechanisms do not operate unless there is a fluctuation of the physiological parameter involved.

Comments on Specific Questions

Question 1

Almost all candidates followed the key correctly to identify the organisms within the group Reptilia. The correct use of terminology was not always apparent in the other part questions.

- (a) (i) Almost all the candidates recognised the organisms as reptiles. A few suggested that the group was the amphibians.
- (ii) Most candidates were able to complete the key correctly to gain full credit. A few candidates put letters in all the spaces in the key.
- (b) The candidates generally understood that lizards are part of food chains and webs and that these feeding relationships would be disrupted if lizards were to become extinct. Many recognised the importance of maintaining biodiversity and the possible role of these animals in future research.
- (c) (i) Whilst candidates did not generally comment on the example of the Komodo dragons given in the question, they were able to use their understanding of asexual reproduction to give some sound disadvantages of this method of reproduction. General points were accepted as well as references to the process in plants or even bacteria. The most common answers were the production of identical offspring and reduction in genetic diversity. Many recognised that unfavourable characteristics would be passed on and that there would be less chance of the species evolving. Many recognised that the products of asexual reproduction had 'less chance of survival', but failed to qualify this by adding 'in a varying or changed environment'.
- (ii) Candidates were asked to state two disadvantages of sexual reproduction. The most common answers were that two individuals are required and that the process is slower than asexual reproduction. A few candidates provided excellent answers showing understanding of how the inheritance of recessive characteristics could result in organisms less able to adapt to changes in the environment. However, candidates should know that this is not universally true. There are many examples of organisms possessing recessive characteristics that are common because they are adaptive.
- (d) (i) Candidates understood that meiosis is a reduction division and very little confusion between meiosis and mitosis was seen. Most noted the production of haploid cells, but needed to state that the division was from diploid to haploid. A common error was to state that meiosis was the 'division of gametes'.
- (ii) This question caused some difficulty with few candidates able to go beyond the idea of meiosis producing gametes that then allowed reproduction. It was expected that candidates would show understanding that meiosis is a cause of variation in gametes, and hence offspring, which then leads to competition and to natural selection.

Question 2

- (a) (i) This calculation required candidates to use the x-axis of the trace to determine the duration of one or two breaths and then convert the figure into breaths per minute. The calculation was 60 divided by 5 to give 12 breaths per minute. Some candidates stated that there were two breaths in eleven seconds because they did not notice that the first breath started at one second.

- (ii) The trace showed a very clear difference in the two patterns of breathing. Credit was given for comparison of the breathing rate and the depth of breathing and the increase of lung pressure. Values from the graph were not expected. Often reference was made to the need for extra oxygen or energy during the match, without stating that this is reflected by the increase in the rate and depth of breathing and linking it to the altered pattern.
- (b) Many candidates achieved full credit on this question. However, there was a lack of detail in some answers. No credit was given to answers that described the route taken by air from the atmosphere down the trachea and bronchus to the lungs. The process of inhalation involves the contraction of the diaphragm and the external intercostal muscles, the relaxation of the internal intercostal muscles and the decrease in air pressure inside the lungs. A few answers incorrectly implied that the expansion of the lungs causes the movement of the diaphragm and rib cage.
- (c) (i) Carbon dioxide is a waste product of respiration or metabolic waste. Many answers stated that an excretory product is just a waste product. Candidates should be clear of the differences between excretion and defecation. Some candidates recognised that carbon dioxide is toxic if it accumulates in the body.
- (ii) This question asked for the part of the blood in which most carbon dioxide is transported. Most carbon dioxide is carried in the plasma with some carried inside red blood cells.
- (iii) An increase in the carbon dioxide concentration in the blood lowers or decreases the pH of the blood, making it more acidic. Many candidates gave the correct answer.
- (d) The relationship between more carbon dioxide and more respiration seemed well understood. Fewer candidates commented on the steeper concentration gradient that would occur and lead to increased diffusion. A high rate of aerobic respiration gives rise to high concentrations of carbon dioxide in the blood vessels surrounding the alveoli. This leads to a steeper diffusion gradient between the blood and alveolar air and therefore a greater rate of diffusion of carbon dioxide out across the alveolar wall.

Question 3

- (a) This part proved challenging for some. To achieve the marks, candidates had to name and give the appropriate letter of the skin component identified by the responses to cold weather in Table 3.1. The sweat gland (U) was often misidentified an arteriole (T). Candidates often stated that capillaries constrict rather than giving arterioles as the answer in the second row.
- (b) Involuntary actions were generally understood and the Examiners saw most of the points included in the mark scheme. The most common idea given was that 'involuntary action does not require thinking'. Many candidates who referred to the speed of responses and the probable protective nature of those responses scored highly. Very few mentioned the role of glands as effectors.
- (c) Candidates were asked to describe how the nervous system coordinates the response of the skin to cold weather. The best answers included a description of the passage of nerve impulses from temperature receptors in the skin to effectors to stimulate muscle contraction in the shivering response. Credit was not awarded for descriptions of the skin in either cold or hot conditions. Some candidates used the term 'messages' instead of impulses.
- (d) The explanation of negative feedback proved challenging to some. Credit was earned for the idea that the body coordinates actions to reverse any change of temperature and that this will result in a return to the normal or optimal body temperature. Very few noted that a change in temperature acts as a stimulus. Only a few answers mentioned homeostasis.

Question 4

- (a) There is a definition of the term *tissue* in the syllabus. Many candidates did not define this term accurately, either missing the point that the cells are similar in structure or that they work together to achieve their function.
- (b)(i) Most candidates recognised that tissue **A** was spongy mesophyll.
- (ii) The majority of candidates stated that gases travel through the stomata by diffusion.
- (c) Candidates needed to observe the photograph carefully to answer this correctly. The cell labelled **B** is a cell from the palisade mesophyll. Although actual identification was not required it appeared that all the candidates knew this. The question asked how the cells differed and differences in structure were expected, e.g. 'cell **B** has many chloroplasts not seen in root hair cells'. Some candidates concentrated on differences in function of the two cells.
- (d) Careful reading of the question was essential as some responses contained many details of how water enters the root when the question required candidates to outline the events occurring after this point. It was expected that answers should include passage through the xylem, movement into the leaf by osmosis and evaporation from surfaces of mesophyll cells. Exit from the stomata was not credited as the question only asks for how the water reaches the stomata.
- (e)(i) Correct observation of Fig. 4.1 allowed candidates to make accurate comparisons between the leaf hairs on the upper and lower surfaces of the leaf.
- (ii) A sizeable group of candidates believe that plants can obtain water through their stomata and use this water for photosynthesis, and that plants require high humidity to cool down. Better answers included reference to a reduction in transpiration and therefore less water loss.

Question 5

- (a) The majority of candidates identified the type of pollination correctly as wind pollination. Feathery stigma, large anthers and anthers hanging outside the flower were the most common points given in explanation.
- (b) Cross pollination was identified by most of the candidates.
- (c) Structure **B** on Fig. 5.1 was identified correctly by many candidates, but even those who could not name it knew its general function.
- (d) Candidates were asked to describe what happens at fertilisation in flowering plants. It was expected that candidates would state that the ovum and the male nucleus delivered by the pollen tube fuse together to form a diploid zygote. In some cases incorrect use of specific terms were often barriers to achieving full marks.
- (e) All the parts of this question were answered correctly by many candidates by giving the following answers: (i) ovule and (ii) ovary (wall). The most common correct answer to part (iii) was the colonisation of new areas.
- (f) Most candidates were aware that enzymes are involved in respiration and that stores of carbohydrate, lipid or protein within the seed must be broken down to allow germination. Some candidates were able to provide specific examples of enzymes and state their roles during germination. Amylase and the breakdown of starch were the most common. Candidates who wrote 'starch stored in the seed is broken down by amylase' earned full credit.

Question 6

- (a) (i)** The answer to the calculation is 48.9%, but candidates were asked to give their answers to the nearest whole number so only 49% gained full credit. Those candidates who showed their working but who did not round up their answer gained partial credit.
- (ii)** Good responses seen included: 'less paper was used', 'other materials are replacing paper' and 'more information is distributed electronically, not relying on paper'.
- (iii)** Candidates needed to consult the Table 6.1 to find the answer to this question. There were only two possible correct answers – green kitchen waste and glass. Some candidates did not read the question carefully and thought of other materials that could show the same trend.
- (b)** The details of paper recycling were not well known. Candidates that did know about the process often omitted deinking from the sequence of stages that they described.
- (c)** Candidates were asked to consider the consequences of an increase in greenhouse gases in the atmosphere. Almost all stated that global warming was one such consequence. The environmental effects of global warming, such as extreme weather conditions and the melting of glaciers, were often quoted. Few candidates gave positive effects as they did not point out that an increase in the carbon dioxide concentration would lead to an increase in photosynthesis and higher yields of crops. Candidates should be careful not to confuse the effects of greenhouse gas emissions with other forms atmospheric pollution such as ozone destruction by CFC's and the formation of acid rain.

BIOLOGY (US)

Paper 0438/04
Coursework

Key Messages

The choice of tasks must be made very carefully, to ensure that the task allows candidates to demonstrate their full abilities within the chosen skill area or areas.

Work should be fully marked (annotated) by the teacher.

Details of each task must be provided for external moderation.

General Comments

External Moderators require complete information about how the assessment of candidates was carried out. This includes full details of the tasks that were set. This could be in the form of copies of the worksheets provided to the candidates, or a summary of oral instructions that were given to them.

It is also important that the samples of candidates' work have been fully and clearly marked by the teacher carrying out the assessment. This involves writing on the work itself by hand, or adding comments in Word if the work has been submitted to the teacher electronically. Original work, annotated by the teacher, is expected rather than copies.

For C1, no written work by the candidate will be produced, but the Centre should provide some evidence for the way in which the mark has been obtained. This is generally done in the form of a checklist, completed 'live' as the candidates work through the task.

In general, Centres have become adept at providing tasks that allow candidates access to the full range of marks. Examples that make this difficult include; results charts that contains only three results of food tests, as this does not allow a candidate to reach a mark of 5 or 6 for C2; non-quantitative tasks make it almost impossible to achieve a mark of 6 for C3, and problems that do not involve the effect of one variable on another preclude the award of high marks for C4.