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Examiners' Report

IGCSE Biology (4325)

June 2006

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BIOLOGY 4325, CHIEF EXAMINER'S REPORT

General Comments

The Foundation Tier paper had many fewer candidates than the corresponding Higher Tier paper. However, most candidates were able to complete the papers and there was little evidence of candidates running out of time. Most questions were attempted by the candidates.

Paper 1F, Section A

Questions in this section are targeted at grades E, F and G.

Question 1

This consisted of ten objective answer items where candidates had to choose the most appropriate answer from the four options given. Many candidates earned high marks on these items with items (i) and (j) proving the most difficult for candidates.

Question 2

Part (a) required candidates to identify the trachea, bronchus and diaphragm from a section through the thorax. This was completed successfully by almost all candidates. In (b), candidates completed sentences describing the link between smoking and heart disease. Some candidates were unable to name the coronary artery and state clearly that blockage of this artery would deprive the heart of oxygen and glucose; weaker responses included 'blood' and 'food'.

Question 3

This question described the feeding relationships between rice, insects and spiders. Candidates had to insert these organisms into a food chain in the correct order in (a), with arrows showing the direction of energy flow. All but the weakest candidates were able to gain full marks, with a few losing credit for arrows in the wrong direction. The rest of the question was also well answered, with candidates explaining why the farmer would want to reduce the number of insects, and the meaning of biological control.

Question 4

Here, candidates were asked to give three conditions that a seed requires for germination. Popular answers included water, oxygen and a warm temperature. In questions such as this when three answers are required, candidates should choose the most appropriate three responses and **not** include a list beyond three, as only their first three responses will be marked.

Question 5

This question was about the production of yoghurt from *Lactobacillus.* Most of the candidates were able to identify the organism as a bacterium, with a few thinking it was a fungus. Most candidates could also explain the purpose of pasteurisation; and could name the sugar present in milk. Part (b) presented a graph showing the growth of bacteria with time. Candidates varied in their ability to identify the regions of the graph where the numbers were lowest (A), where they increased fastest (B) and the region where most lactic acid is present (D).

Question 6
This question illustrated the process of micropropogation to produce carrot plants using tissue culture. Candidates were asked to suggest what might happen if the parent was not free from disease, and most were able to suggest that the offspring plants would not grow, or that they would inherit the disease. They were also able to explain why the agar jelly used should be sterile. Part (d) asked what happens between the embryo stage and the new adult plant. Few candidates were able to describe the growth of roots and shoots as the carrot plant developed.

Question 7
Candidates were given a bar chart showing how the protein required by a female changed with age. Many candidates were able to use the graph to extract information to answer which age group requires most protein, and how much should be eaten by a 16-year old. They also used the figures to calculate the change in protein intake between 5 to 6-year olds and 9 to 10-year olds. However, some candidates failed to earn full credit for their explanation as to why 9 to 10-year olds require more protein. Correct responses required a statement stating that there is faster or greater growth at this age. Part (c) asked why a mother who breastfeeds her baby needs more protein. Answers including statements such as "milk contains protein" and "the child is growing" were creditworthy and were produced by the better candidates. In (d), candidates had to link food substances with their roles in the body: this was well done by most candidates.

Paper 1F, Section B / Paper 2H, Section A

Questions in this section are targeted at grades C and D.

Paper 1F Question 8 / Paper 2H Question 1
This was a straightforward question, aimed to settle the Higher Tier candidates. The processes were understood by most, although a few missed the reference to energy with regard to absorption of mineral ions, so wrongly chose diffusion as their answer.

Paper 1F Question 9 / Paper 2H Question 2
This question discriminated very well. Many candidates were able to add correct arrows. No marks were awarded if arrow heads were missing, or if they were wrongly attached. Whilst most candidates realised that **K** represented photosynthesis, only the best correctly realised that there were three letters, **J**, **N** and **L** that represented respiration. A pleasing number of candidates noted carbon dioxide as the answer to (b)(i), recalled an acceptable named carbohydrate, and named a type of decomposer - bacteria and fungi being the most popular responses.

Paper 1F Question 10 / Paper 2H Question 3
In (a), most candidates recognised **P** as cytoplasm. Nucleus was not accepted as the name for **Q**: the correct term is nucleoid. However, DNA, chromosome and genetic material were all allowed. The calculation proved difficult. The correct answer (100%) was seen, but many thought the answer was 50%. A mark was available for some sign of correct working, even if the answer was wrong. Therefore, candidates are encouraged to show their working. The role of white blood cells was generally understood, although phagocytes **and** lymphocytes were only discussed by the better candidates. Candidates are encouraged to use correct terminology in their answers, e.g. 'engulf' is a better word to use when describing phagocytosis than 'eat' or 'swallow'. Most candidates recalled plasma as the pale yellow liquid that blood cells float in. The biology of red blood cells was appreciated by many, although correct terminology was, again, sadly lacking. Examiners prefer to see the term 'biconcave' rather than 'doughnut-shaped' or 'disc-shaped with a dip in the middle'.

Paper 1F Question 11 / Paper 2H Question 4
The blood vessels linked to the liver are less well-known to candidates than those to the heart. As such, this question proved to be challenging. However, a pleasing number identified all three blood vessels correctly. If they had named blood vessel **Y** incorrectly in (a), candidates were then not penalised if they gave the same incorrect name in (b). Part (c) discriminated well: the better candidates wrote about the storage of glucose as glycogen, and the role of insulin. Very few recalled that the respiration of glucose would also take place in the liver. Some candidates lost a mark by spelling glycogen incorrectly as glucagon or glucogen. Examiners are strict with ambiguous spellings of this nature.

Paper 1F Question 12 / Paper 2H Question 5
A surprising number of candidates struggled to write a decent 'mini essay'. Their knowledge reflected that of a layman, rather than a biologist, as did the language used. Accounts confused global warming with other ecological problems such as acid rain or the depletion of the ozone layer. Better candidates recalled at least two greenhouse gases, named their source and described in an erudite fashion the ecological consequences. Practice at planning and writing 'mini essays' of this nature would benefit all candidates.

Paper 1F Question 13 / Paper 2H Question 6
The 1st or 2nd week were accepted as answers to (a)(i), and most candidates made these choices. Oestrogen, the hormone that repairs the uterus lining, was known by many, although only the better candidates knew that it is released by the ovary. Several candidates incorrectly named the pituitary as the endocrine gland involved. Progesterone was expected as the answer to (b), a response again only appreciated by the better candidates. Ovulation, or a correct description of ovulation, was rewarded in (c).

Paper 1F Question 14 / Paper 2H Question 7
Good candidates understood that protease enzyme would digest protein, and therefore cause damage to lung tissue. Weaker candidates tended to repeat words in the question, merely stating that lung cells would be damaged. The fact that gas exchange would be reduced was understood by most, but only the better candidates appreciated that this was because of a reduced number of alveoli with a consequent reduction of surface area. In (b), most candidates recalled that fertilisation requires fusion with a sperm cell, but others failed to recall that mitosis is the type of cell division that would bring about the production of sheep cells. Perhaps the fact that the egg cell is a sex cell confused candidates into thinking that meiosis was involved. As ever, candidates were penalised for incorrectly spelling mitosis: for example "meitosis" was not rewarded. Many candidates were able to recall the correct words needed to complete the passage in (b)(iii) describing the steps needed to produce large numbers of transgenic cloned sheep.

Paper 2H, Section B

Questions in this section are targeted at grades A*, A and B.

Question 8
This question was answered well by most candidates, who demonstrated a good understanding of the concept of energy flow.

Question 9

The importance of working paddles to mix the contents of the fermenter, therefore allowing all the microorganisms to make contact with oxygen or minerals was understood by most candidates. Equally, most appreciated the need to cool the fermenter by using the water jacket. However, only the better candidates explained that this is needed to prevent killing the microorganisms, or to prevent their enzymes denaturing. The vast majority identified the source of oxygen for the fermenter but its importance in aerobic respiration was less well appreciated. There were many good answers to (d), demonstrating understanding that steam will sterilise the fermenter and that it cools to water, a substance that is harmless to microorganisms and will not contaminate any product. A number of responses were rewarded in (e), including an appreciation that the human insulin can be produced faster, that it is less likely to produce side effects because it is the same as normal human insulin, and also the ethical view that no animals are killed.

Question 10

Candidates struggled to name the genetic material in the virus correctly as DNA or RNA (both were accepted). They also struggled to identify the protein coat. However, most candidates understood that viruses reproduce inside host cells and were also able to give an example of a virus.

Question 11

Candidates are encouraged to look at the number of marks allocated to questions and to ensure their answers reflect this. In (a)(i), four marks were available for distinct points: the genotype of the parents, the gametes produced, the consequent offspring and, finally, the phenotype of the offspring. The gamete mark was often overlooked, as was the phenotype of the offspring. A pleasing number of candidates understood that there was a 50% probability of the couple producing a child who will not develop Huntington's disease. Again, an encouraging number appreciated the peculiar nature of this disease and noted that people will have had their children before knowing they have the disease. It is appreciated that this scenario is less of an issue these days, but the students had to work with the information provided. Most noted the spinal cord in (c) as the other part of the central nervous system and were able to provide reasonable accounts recalling the events responsible for the rapid withdrawal of a finger from a hot object. Weaker candidates confused the sequence of the neurones and lost some credit. However, wherever possible, examiners marked the points in the mark scheme independently.

Question 12

Part (a) was well answered, with only a small number of candidates not scoring full marks. This was usually because they wrongly described the curve for mean water temperature. Candidates clearly have a good understanding of photosynthesis, with many appreciating that low temperatures or low light intensity in winter would reduce photosynthesis, with a consequent detrimental affect on plankton numbers. Part (c) was the most difficult part of the paper. However, the better candidates were able to appreciate that the insolubility of starch affords osmotic benefits which allow more storage in less space. Marks were also given for recognition that starch is a larger molecule than glucose, is less likely to be lost from cells, and is less likely to become involved in reactions.

Question 13

In (a)(i), many candidates lost marks by repeating the question. The evaporation of sweat linked to loss of heat was required, but many stated that sweating produces water on the skin, which helps the body to cool down. In (a)(ii), the perennial error of describing the movement of blood vessels nearer to the skin surface was found in a disappointingly large number of scripts. Vasodilation is only understood correctly by the better candidates, as is its effect of bringing more blood to the skin surface where it can transfer heat from the body as radiation or convection. A pleasing number of candidates understood the role of ADH in helping to conserve water in the blood of the dehydrated cyclists, although some did confuse the issue by stating that less ADH would be released. Many candidates gave an acceptable definition of homeostasis and were able to give acceptable examples such as the control of temperature or of glucose levels. Candidates who stated osmoregulation as an example had clearly not read the question carefully.

Question 14

Almost all of the candidates were able to describe correctly that the shoot is bent towards the light. Most also recalled that the name of this response is positive phototropism. Only the better candidates appreciated that more auxin will be found on the darkened side of the shoot, and that reason for the bending is that auxin causes cells to elongate. Many recalled the role of geotropism in the response of the seedling root, and that the advantages gained include anchorage and access to water minerals.

Question 15

At Higher Tier, detailed answers are required and, in (a), a named mineral was expected together with its function. Therefore, candidates who recalled the role of nitrates in the synthesis of proteins gained credit, as did those who recalled the role of phosphate in DNA or ATP, or those who recalled the role of magnesium in chlorophyll manufacture. This level of response was only seen in the scripts of the better candidates. In (b)(i), candidates were expected to appreciate that insects would be killed and that the advantage of this would be better crop productivity. Marks were credited for recognising disadvantages by referring to the possible detrimental affect on other organisms, the possibility of the development of pest resistance and the need for reapplication. Biological control as a term was recalled by the better candidates, although most others were able to describe what the term means. In (c), the better candidates named restriction and ligase enzymes and were able to provide acceptable examples of vectors. The use of the terms ‘scissors’ and ‘glue’ was not credited. Part (c)(ii) was a challenging question to finish the paper. However, many candidates appreciated that GM plants may give higher crop yield or better quality of crops, as well as helping with pest resistance which would reduce the need to use pesticide sprays. The fact that members of the public do not accept the idea of genetically modifying crops was credited as a disadvantage, along with the fear that long-term effects are unknown and the possible consequences of genetic transfer between species.

Paper 3

General comments

This paper had similar requirements to those set in May in November 2005, and was felt to be of a similar standard. First impressions were that the candidates did not perform quite as well as in May 2005, although a wide range of marks was seen.

Question 1
Most candidates answered this correctly, although some candidates gave **B** instead of **D**, linking the stopwatch to exercise.

Question 2
Most candidates were able to count the seeds in (a)(i) and gained full marks here. In (a)(iii), there were some errors in the scale of the graph, and some axes were the wrong way round. A few candidates missed out years when labelling their axes. In (a)(iv), most candidates gave sensible answers relating to the advice. In (b), most candidates were able to give two factors that should be kept the same. Again, in (c), candidates understood about reliability and said the experiment should be repeated or that more readings should be taken. A few lost marks as they referred to ages.

Question 3
Several candidates did not make a point that reflected even or equal treatment in (a)(i). Some candidates gave the answer 5 in (a)(ii), suggesting that they did not read the question properly. Part (b)(i) was well answered, as was (ii), though some candidates referred to human error. Part (c) was done well by most, but some candidates did not appear to understand that all light or all dark was required for a control.

Question 4
Although some candidates referred to a 'graduating cylinder', most answered (a) correctly. Part (b)(i) was answered well, although there was some reference to 'stop mixing' or other incorrect suggestions. In (b)(ii), a significant number of candidates made no reference to time, or to a method for varying temperature, and therefore only gained one mark. In (b)(iii), most candidates realised that a change in the light would cause the anomaly, but a significant number tried to explain why it was an anomaly instead. Most candidates answered (c)(i) correctly, although many also included an explanation here instead of in (ii). In (c)(ii), most missed the first mark on low kinetic energy or movement, but many got the marks for optimum and denatured. Some referred wrongly to yeast being denatured or enzymes being killed. Many candidates missed the marks in (d), but a few understood what was wanted and expressed their answers well. Readings at closer internals was more frequently seen than those relating to around the optimum.

Question 5
Part (a)(i) was generally well done, but there were some odd formats in the table. Part (a)(ii) was also well answered, either with an explanation or an example. Many candidates gave a description of other factors that would affect transpiration in (b), rather than concentrating on more evidence to support the conclusion.

Question 6
There were many good accounts scoring full marks. The most common errors were heart rate measurement often not linked to time, little mention of control and measurement of breathing instead.

COURSEWORK (PAPER 4), PRINCIPAL MODERATOR'S REPORT

General Comments on Science Coursework

The coursework component is only available to centres which are recognised by Edexcel as International Teaching Institutions.

The number of students entered for this component of the iGCSE examination was as follows:

Code	Subject	Number entered in 2006	Number entered in 2005
4325	Biology	203	162

All of the centres that entered students for this component of the examination had their science coursework moderated by Edexcel's co-ordinating Principal Moderator for GCSE. The moderating instrument used was the Sc1 criteria as used by Home centres, using exemplars provided by the JCQ (Joint Council for Qualifications) as a guide. Centres entering students for the coursework component of the iGCSE examinations in 2006 therefore had their coursework moderated to the same standards as for all Home centres.

Biology 4325

The tasks chosen by the centres were generally appropriate for iGCSE students. Osmosis in potato chips was the most common practical task seen this year. Two other tasks seen this year were: "Photosynthesis"' and "Anaerobic Respiration in Yeast". All of these are very familiar tasks to Home centres, and can yield the full range of GCSE grades. The one exception was "leaf structure", which was **not** an investigation. For this reason, it is not recommended.

The quality of annotation has improved this year, with only one centre not annotating the student's work in the approved manner. Teachers are respectfully reminded that when scripts are marked, teachers should use the printed coursework mark criteria as a guide, putting minimalist annotation such as P6b, P8a, and P8b alongside the point in the script where the student achieves the mark description.

Centres are respectfully reminded that students should work individually, with minimal teacher guidance, on the investigations presented for moderation. For this reason, one would not expect to see virtually identical scripts with identical safety issues, the same preliminary task with the same number and range of readings, the same task with the same results, and the same improvements suggested.

BIOLOGY 4325, GRADE BOUNDARIES

Option 1 : with Written Alternative to Coursework (Paper 3)

	A*	A	B	C	D	E	F	G
Foundation Tier				**58**	**46**	**35**	**24**	**13**
Higher Tier	**83**	**71**	**59**	**48**	**37**	**31**		

Option 2 : with Coursework

	A*	A	B	C	D	E	F	G
Foundation Tier				**50**	**48**	**36**	**24**	**12**
Higher Tier	**83**	**72**	**61**	**50**	**38**	**32**		

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demands of the question paper.

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