BIOLOGY 4325, CHIEF EXAMINER'S REPORT

General comments
This paper was sat by a very small number of candidates. It was pleasing to note that all questions were attempted and were accessible to the candidates. As expected, performance declined as the questions became more difficult. Based on the level of performance, it was felt that all the candidates had been entered for the correct Tier.

Paper 1F

Question 1
The lowest mark for this question was 6 which shows that candidates entered at this level find this style of question a comfortable introduction to the paper. The parts that caused most difficulty were (d), (f), (h), (i) and (j).

Question 2
Most candidates recognised the red blood cells and counted 6 as the correct answer. A few counted 2, presumably counting the white blood cells. Part (b) posed most difficulty, with few candidates able to recall that glucose, amino acids, fatty acids and glycerol are found in blood plasma. The parts of an animal cell are well known to candidates and a pleasing number gave correct answers for this unfamiliar organism.

Question 3
Part (a) was surprisingly challenging and answers ranged from a million to more sensible, but incorrect, numbers. Nearly all candidates are aware that sperm cells are made in the testes but many thought that the ovary was the other type of cell involved in fertilisation.

Question 4
The number of producers was most often correct, but errors were made in appreciating how many animals were in the food web, and calculating the number of food chains posed a real challenge for most. Part (b) was surprisingly difficult with very few appreciating that the number of foxes is likely to decrease and the number of mice is likely to increase.

Question 5
All parts of this question were well-answered apart from part (v). The fact that food will run out and that waste products will build up to toxic levels were concepts too difficult for many to suggest. The possibility of temperature rising to dangerous levels was also credited.

Question 6
The graph was well done by all, with accurately plotted points joined by neat straight lines. All appreciated that the pulse rate increases after a cigarette though very few appreciated that an artery is used to measure pulse rate. Very few candidates calculated that it would take 40 minutes for the pulse rate to return to normal after smoking the cigarette. However, nearly all the candidates appreciated that the diseases named all affected the lungs.

Question 7
Nearly all the candidates knew that the optic nerve connects the eye to the brain, but very few knew that the cornea bends light. Most believed this was achieved by the retina or the iris. Many appreciated that a cloudy lens would make it more difficult to see, but very few explained that this might be due to an inability to refract or transmit light.

Question 8
This question was well-answered, no doubt helped by the list of words provided.

Question 9
This proved to be a challenging question and would suggest that candidates need more opportunities to appreciate the common features associated with the variety of living organisms. Most could name an animal but the features of bacteria were not known. Many named a fungus as an example of a bacterium. A small number of candidates recognised the final group as viruses.

Question 10
This question was difficult for the candidates, most gaining only one mark for appreciating that males are XY and females are XX.

Question 11
This question was well-answered apart from part (b). Most thought that a chloroplast was a cell.

Question 12
Part (a) was a challenge with many, but not all, believing that N was the genotype of a heterozygous parent and Nn was the genotype of a child with cystic fibrosis. A few candidates appreciated that there were two homozygous children. In part (b) (i), a pleasing number of candidates understood that the reason why digestive enzymes are not present in the duodenum is because the pancreatic duct is blocked by mucus. Part (ii) was poorly answered, most candidates only able to recall the name of one enzyme. Part (iii) required an appreciation that the acidic conditions in the stomach could denature most enzymes or that stomach protease could digest enzymes. These points were not appreciated by most candidates.

Question 13
Many candidates find it difficult to write their ideas in continuous prose and would benefit from practising this skill. Answers tend to be too superficial and lack the detail needed to gain marks. The majority of candidates did not understand how glasshouses can be used to overcome the limiting factors of photosynthesis and failed to discuss how increasing temperature, carbon dioxide and length of exposure to light can help photosynthesis. Named fertilisers were required rather than repeating the term fertiliser, and the function of these named fertilisers, such as nitrate and phosphate, was expected.

Question 14
The brain and spinal cord as parts of the central nervous system are known to many, but the differences between nervous and hormonal communication are more problematic. Most were unable to gain any marks in part (b) and many put ticks and crosses into the empty boxes.

Question 15
A surprising number of candidates failed to appreciate that a full description of the changes in the oxygen level after the sewage entry required not only a comment about it decreasing, but also a comment about it then increasing. The candidates then described the changes in oxygen level as their answer to part (a) (ii), clearly not understanding the meaning of the word 'explain'. In part (b), a surprising number only drew a line showing a decrease in fish numbers, forgetting to draw a line showing an increase in fish numbers further along the river.

Question 16
Most candidates understood that respiration is the process that releases energy and most appreciated that glucose and water were the missing words needed to complete the equation. However, all were unable to describe how air is taken into the lungs. Descriptions lacked correct detail, merely describing the route taken and failing to discuss the role of the intercostal muscles and diaphragm in changing the volume and pressure in the thorax. A pleasing number of candidates recalled lactic acid as the substance produced in by muscle cells in anaerobic conditions.

Paper 2H

Question 1
This proved to be a challenging question and would suggest that candidates need more opportunities to appreciate the common features associated with the variety of living organisms. Most could name an animal but the features of bacteria are less well known. Many named a fungus as an example of a bacterium. About half the candidates recognised the final group as viruses.

Question 2
There was a range of responses for this question. Those who understood sex inheritance gained full marks. Those less assured of the role of X and Y chromosomes made errors: YY being male or female or parents being a single X or a single Y. Weaker candidates struggled with the difference between a genotype and a phenotype.

Question 3
Part (a) was well-answered, though weaker candidates failed to connect organelle with mitochondria and tissue with phloem. Approximately 25% of the candidates knew that chloroplasts are organelles.

Question 4
This question produced the full range of marks awarded and served as a good discriminator. Part (a) tended to be answered quite well with many, but not all, appreciating Nn as the genotype of a heterozygous parent and nn as the genotype of a child with cystic fibrosis. The better candidates appreciated that there were two homozygous children. In part (b) (i), only the very best candidates understood that the reason why digestive enzymes are not present in the duodenum is because the pancreatic duct is blocked by mucus. Part (ii) was well answered though some found it difficult to name all three different types of digestive enzyme. Part (iii) required an appreciation that the acidic conditions in the stomach could denature most enzymes or that stomach protease could digest enzymes. There were some excellent answers which were matched by some very weak answers.

Question 5
Many candidates find it difficult to write their ideas in continuous prose and would benefit from practising this skill. Answers tend to be too superficial and lack the detail needed to gain marks. The better candidates understood how glasshouses can be used to overcome the limiting factors of photosynthesis and discussed how increasing temperature, carbon dioxide and length of exposure to light can help photosynthesis. Named fertilisers were required rather than repeating the term fertiliser, and the function of these named fertilisers, such as nitrate and phosphate, was expected.

Question 6
The brain and spinal cord as parts of the central nervous system are known to many, but the differences between nervous and hormonal communication are more problematic. Most appreciated that nervous communication is faster and that the message is carried by nerves. Only the better candidates understood that the duration of the response is shorter and that the nature of the message is electrical.

Question 7

A surprising number of candidates failed to appreciate that a full description of the changes in the oxygen level after the sewage entry required not only a comment about it decreasing, but also a comment about it then increasing. The weaker candidates then described the changes in oxygen level as their answer to part (a) (ii), clearly not understanding the meaning of the word 'explain'. In part (b), a surprising number only drew a line showing a decrease in fish numbers, forgetting to draw a line showing an increase in fish numbers further along the river.

Question 8

Most candidates understood that respiration is the process that releases energy and most appreciated that glucose and water were the missing words needed to complete the equation. However, most were unable to describe how air is taken into the lungs. Descriptions lacked detail, merely describing the route taken and failing to discuss the role of the intercostal muscles and diaphragm in changing the volume and pressure in the thorax. A pleasing number of candidates recalled lactic acid as the substance produced in by muscle cells in anaerobic conditions.

Question 9

Many were able to recall the parts labelled, though the Fallopian tube was less well known. The role in egg production by the ovary was known by many, though its role in the release of oestrogen was only recalled by the better candidates. Candidates were asked to use an arrow in parts (b) (ii) and (iii) and a few failed to do this which made it difficult at times to award marks, as the positioning of the letters F and I were unclear. The penis was not accepted as the answer for part (c).

Question 10

Most candidates were able to understand the information in order to provide the correct colour changes. In addition, a pleasing number appreciated the role of respiration and photosynthesis in changing the levels of carbon dioxide. Weaker candidates tended to refer to the role of these processes in changing oxygen levels. The more able candidates were brave enough to realise that the colour in all three tubes after twelve hours in the dark would be yellow.

Question 11

This question was well-answered. The main areas of error were understanding that white blood cells prevent diseases and that carbon dioxide and urea (not urine) are the waste products transported in plasma.

Question 12

Many knew that transpiration is the term used to describe water loss from the leaves of a plant. Only the better candidates calculated that 2.5 cm per minute was the average rate of water loss. One mark was given to those who calculated the answer as 12.5, failing to divide this number by 5. In part (b) (ii), most appreciated that the bubble would not move as much but most could not explain why, suggesting that their understanding of kinetic energy and its effect on diffusion is poorly understood. Those who correctly appreciated that the bubble would also move less in low light intensity incorrectly explained that this was due to a drop in the rate of photosynthesis. Only the most able were aware of the closing of stomata in dim light. There were some good answers to part (c), appreciating that the hairs would reduce water loss by trapping moist air and reducing the concentration gradient. Weak candidates associated the hairs with those on human skin and described their role in temperature regulation.

Question 13
Very few candidates scored highly in this question. The techniques used by fish farmers seemed unknown to most candidates. The examiners were hoping for comments such as: reducing predation by using nets; controlling disease by using antibiotics; controlling water quality by removing waste or pumping oxygen; feeding with protein-rich food to help growth or feeding small amounts regularly to prevent uneaten food being decomposed. Other ideas relating to selective breeding and the use of genetic modification were credited.

Question 14
A variety of different values was given for part (a), but those who understood what a trophic level is wrote 5 as the correct response. Most were able to answer part (b) correctly, though some did name water snails as their incorrect answer. A very small number of candidates appreciated that the arrows in a food chain represent the flow of energy. In part (d), a correct food chain was constructed by most candidates. Common errors included stopping the food chain at water boatmen, believing water fleas are eaten by mayfly larvae and putting the arrows the wrong way round. There were some excellent answers for part (f), explaining that the population of mayfly larvae could increase as more algae would be available, or it could decrease as the water boatmen had lost a food source and would need to feed elsewhere.

Question 15
Very few candidates were able to describe how a mammal could be cloned. A large number had some idea of the process but wrote accounts which showed confused understanding about the source of nuclei and the meaning of the terms diploid and haploid. Many struggled to spell 'surrogate' correctly, but were not disallowed a mark for this error.

Question 16
Candidates always find the nitrogen cycle challenging and this question was not an exception. Only the best candidates recognised the processes of nitrogen fixation, denitrification, nitrification and decomposition in part (a) (i). In part (ii), the term 'bacteria' was sufficient to gain the mark, though candidates who wrote nitrifying bacteria were not credited. The active uptake of nitrates by root cells and their use in the manufacture of amino acids was known by only the better candidates. Those who took a different route, explaining the role of nitrogen fixing bacteria helping to make nitrates available, were credited.

Question 17
Selective breeding is a difficult concept but many candidates were aware of the principles involved. Some confused the process with cloning, micropropagation, other methods of asexual reproduction such as cuttings; even genetic modification had a mention. Reference to organisms had a tendency to be too vague: 'wheat' is better than 'crops', and 'cattle' is better than 'animals'. Many candidates made up desirable characteristics to suit their needs. As such, their answers tended to be unacceptable.

Paper 3

General Comments
Only 38 candidates sat this paper. The paper was felt to be of a similar standard to the May 2005 paper but, on the whole, the candidates' performance was not as good. There were few marks seen over 40.

Question 1
Part (a) was answered well, with nearly all candidates recognising a thermometer and knowing that it measures temperature. Similarly, in part (b), nearly all candidates were able to take the correct readings on the thermometers and work out the difference between them.

Question 2
In part (a), nearly all candidates knew that starch was tested using iodine, although one or two candidates incorrectly put Benedict's. In part (b), most candidates were able to identify the colours of both the positive and negative results obtained correctly. In part (c), the majority of candidates showed a good knowledge of the food test for glucose. Most gained two marks for identifying Benedict's as the reagent and for knowing that heart was required. Similarly, most candidates knew the positive result with Benedict's. It was pleasing to see so many candidates had the idea that the darker the colour, the more glucose present.

Question 3
In part (a), the majority of candidates was able to calculate the total number of pea plants, although one or two candidates misread the question and incorrectly gave the average instead. Most candidates were able to calculate the estimated total population size, although a few miscalculated by a factor of 10 or 100. In part (b), most candidates were able to rearrange the results in ascending order, although a few candidates appeared not to have understood the question. Nearly all candidates were able to conclude that there were more pea plants in field Y compared to field X.

Question 4
Most candidates were able to identify the gas correctly as oxygen in part (a), although a few candidates incorrectly gave carbon dioxide instead. In was pleasing to see so many candidates suggest that the light intensity could be varied by moving the lamp closer or further away from the pondweed. Part (c) proved to be challenging for many candidates. Only the better candidates gained the second mark relating to counting or measuring in a specific period of time. Part (d) proved to be a good discriminator with only the better candidates showing the graph to plateau after rising. Part (e) was answered well, with the majority of candidates gaining full marks. The most common factors mentioned were carbon dioxide and temperature.

Question 5
This question discriminated well, with the very best candidates scoring high marks and the weaker candidates finding much of it challenging. In part (a), it was clear that many candidates did not fully understand what is meant by a fair test. The most common correct answers to the first part were that fact that the students were all female and were all of the same age. Only the very best candidates knew that a fair test was necessary to know that any difference found was due only to the change in the length of time of exercise. Many candidates answered part (b) well, being able to calculate the missing value of 26 and identify the anomalous result of student B at 4 minutes. In part (c), most candidates gained two or three marks for the graph. Marks were lost by not fully labelling the axes and by not making the best use of the graph paper. Many candidates started the scale for mean breathing rate at zero, despite

the range being from 15 – 25. In part (d), most candidates gained at least one mark for a simple description of the relationship between the breathing rate and the length of time of exercise, with the better candidates gaining the second mark for further detail, such as direct proportion. It was pleasing to see that most candidates were able to explain the results, although some of the weaker candidates merely described the results again. Part (e) was not well done. Most candidates did not appear to understand the difference between reliability and accuracy. Reliability refers to ensuring that the results obtained on different occasions would be the same. Accuracy refers to how correct the results are and depends largely on the methods used to obtain them.

Question 6
The candidates who scored the best marks here were those who actually answered the question asked. Many candidates said what results they would expect and why, instead of writing about the method they should use. Very few candidates referred to fair testing.

BIOLOGY 4325, GRADE BOUNDARIES

Grade	A*	A	B	C	D	E	F	G
Option 1				60	48	37	26	15
Option 2				62	50	38	27	16
Option 3	80	71	60	49	35	28		
Options 4 + 6	85	74	62	51	37	30		

Option 1: candidates taking paper 1F and paper 3
Option 2: candidates taking paper 1F and submitting coursework
Option 3: candidates taking paper 2H and paper 3
Option 4: candidates taking paper 2H and submitting coursework
Option 6: candidates taking paper 2H and transferring coursework

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