BIOLOGY

Paper 0610/01

Multiple Choice

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

General comments

Only one question posed profound difficulties and that was essentially in the area often found difficult by Biologists - that of graph interpretation.

Comments on specific questions

Question 1

With 98% opting for the correct answer, this question provided perhaps a little too welcoming a start to the test.

Question 4

Again an easy question, but here it furnished a clear indication that the knowledge of comparative plant/animal cell structure has improved considerably over recent years.

Question 5

With the emphasis now more on the concentration of water molecules rather than on the concentration of solute molecules, a question on osmosis and solution concentration is always likely to catch the unwary. Only 45% opted correctly, but it was the weakest candidates who experienced the greatest problems.

Question 9

Although this question proved to be on the difficult side, it did an excellent job in rewarding those candidates who knew that enzymes are proteins and thus contain nitrogen in their molecular structure.

Question 17

This question was perhaps too easy to make a truly valid contribution to the test, but it was reassuring to see that candidates readily link blocked arteries with heart disease.

Question 25

Again, a very easy question, but it provided a clear indication that the basic mechanics of the male reproductive system are well-understood.

Question 28

Although this question was rather more difficult than many, it was entirely sound and served to show that over 40% of the candidates did not have a clear knowledge of the definition of growth with a quarter believing that height is a major factor.

Question 29

It was surprising to see that a small minority of otherwise good candidates did not believe that any development had occurred between the two stages of seedling growth illustrated.

Question 37

The graph in this question presented information in an unusual fashion. Even so, a required skill at this level is to be able to interpret graphs of population growth. This proved so far beyond three-quarters of the candidates that there was wide-spread guessing - even amongst the most able, many of whom felt that the highest birth-rate would produce the slowest increase in population size.

Paper 0610/02

Paper 2 (Core)

General comments

The overall standard of responses was pleasing with good use of appropriate biological knowledge, understanding and terminology. Very few candidates failed to make a serious attempt to respond to all parts of all questions. There were a number of sections of questions in which it appeared that candidates did not read the question with sufficient care as evidenced in **Questions 2 (b)**, **3 (b)**, **4 (c)**, **5 (b)** and **8 (b)**. The standard of written English seemed comparable with that of previous years and few candidates appeared to have problems in expressing their ideas clearly. As has been observed in previous reports candidates should be made aware of the differences in responses that they should make when questions involve terms such as state, describe, suggest, or explain. Also if a question requires a specific number of responses, such as “State two ways …..” then their response is not enhanced by offering more than two answers. Candidates should remember that if they wish to alter a response they should cross out the original and rewrite it completely in a convenient space. They should not try to squeeze a new response between the lines of the original one. Also candidates should refer to the size of the answer space provided and the mark allocation to judge the breadth and depth of their responses.

Comments on specific questions

Question 1

Candidates were confused when requested to select features that identify each of the four types of organism. They should appreciate that a feature should be unique to that type of organism and not apply to other types. Thus jointed legs, paired legs or an exoskeleton do not identify an arachnid or an insect. Wings do not identify a bird or an insect and petals or leaves with veins do not identify a dicotyledonous plant. There was a wide variety in the number of legs offered for both arachnids and insects. Candidates should make it clear in their response whether they are stating the total number of legs or the number of pairs of legs. A significant number of candidates thought that dicotyledonous plants had two pairs of cotyledons/seed leaves.

Question 2

(a) It was expected that candidates would respond with more than a list of terms to describe the water cycle. Relatively few referred in their descriptions to the role of heat from the sun or to cooling for the processes of evaporation or condensation. Some clearly thought that transpiration was water uptake rather than the loss of water vapour from the leaves. A few candidates completely misunderstood the phrase "the water cycle" and gave responses based on methods of water treatment.

(b) There were the inevitable examples of candidates who gave responses about the effect of deforestation on the water cycle in part **(ii)** and other effects in part **(i)**. This was one of a number of instances where more careful reading of the question would have benefited candidates. In part **(i)** reduced transpiration was infrequently linked to reduced rainfall. Also in part **(ii)** some candidates gave reasons for deforestation instead of its effects on the environment. Candidates offered a wide range of correct responses in part **(ii)** but the production of acid rain and the destruction of the ozone layer were not considered closely enough related to deforestation to be worthy of credit. Many other answers were not given credit because they were too vague, i.e. "we lose trees which will cure illnesses such as cancer".

Question 3

(a) Although many candidates could identify the three phases of the graph relatively few could name it as a sigmoid curve. Of the three phases on the curve **C** was the most commonly correctly identified

(b) Far too many candidates applied the "smaller food supply" conditions to the existing curve and suggested that the population would now decrease. This is another example of a lack of careful reading of the question. In the second habitat, with the smaller food supply, it would be expected that phase **B** would end sooner and that phase **C** would be at a lower level.

Question 4

(a) Candidates frequently confused the umbilical cord with the placenta. Some identified the cord as one of the blood vessels within it, i.e. umbilical artery or vein. In part **(ii)** the question required candidates to identify an unusual feature of the blood in the artery in **A** but many simply stated a general feature of arterial blood not appreciating that this vessel is atypical of arteries. The majority, in part **(iii)**, suggested a relevant feature such as a large surface area, thin walls or having many blood capillaries, clearly utilising their knowledge of intestinal villi. Those who gave erroneous responses may either not have made the link to intestinal villi or may not have known about villus structure.

In both parts **(b)** and **(c)** many candidates seemed to think that fetus and baby are synonymous terms. They should be made aware that the baby is the post-natal individual while the pre-natal one is the fetus, referred to in the stem of both question parts.

(b) Most candidates concentrated on differences in blood pressure or blood groups between the maternal and the fetal blood. It was expected that candidates would be more specific about the potential transfer of harmful materials by referring to drugs, alcohol, toxins, bacteria etc rather than germs or chemicals.

(c) Generalised responses about the transfer of gases or waste substances were not considered worthy of credit. Reference to specific materials linked to the two named organs, such as oxygen, carbon dioxide or urea, was expected. The question equated the placenta to the lung and kidney and not to other organs such as those of the digestive system and thus responses dealing with supplying the fetus with various nutrients were irrelevant.

Question 5

(a) A significant number of candidates probably identified **A** as the testa as they described its role as protection rather than as a food store. Too frequently candidates named **B** and **C**, plumule and radicle, rather than stating what they developed into, shoot and root; a possible result of careless reading of the question. There was the predictable error with **B** linked to the root and **C** to the shoot. Candidates should be aware that an equivalent description of the shoot is the stem and leaves and not just one of these parts.

(b) Few candidates appreciated that the water content of fresh mass can be very varied due to environmental conditions and that dry mass is more closely related to the amount of living material. Too many candidates did not restrict their thoughts in parts **(ii)** and **(iii)** to the specified time periods and often their responses went beyond day **Y** in part **(ii)** or started before day **Y** in part **(iii)**. During the earlier period few appreciated that the fall in dry mass is linked to the products of respiration, carbon dioxide and water, being lost before they are weighed. It is not due to converting stored food materials into components of the developing seedlings as these will still contribute to the dry mass. Most appreciated that the rise in dry mass was linked to photosynthesis and the production of new compounds in set **Q** seedlings but rarely commented on the continuing fall in mass in set **P** seedlings in the later period. There were a number of candidates who muddled the sets of seedlings and discussed the effect of light on set **P** and being in the dark on set **Q**.

Question 6

There were a large number of candidates who gained full credit but some ignored the instruction to use the symbols **B** and **b** and instead used symbols such as **F** and **f** or even **B** and **W**. There were also a few who used the sex chromosome symbols **X** and **Y**. Responses suggested that a significant number of candidates did not utilise the information in the initial two statements as a check on their solutions in the two diagrams. It was not uncommon for gametes to be shown as if they carried pairs of alleles for the feature and for phenotypes in cross 2 to be given as symbols, which represent the genotype.

Question 7

(a) Lipase was frequently thought to be produced in the stomach or the liver. The roles of both lipase and bile were well known and understood by the majority of candidates. However a large number of responses were accompanied by errors or misunderstandings such as “bile breaks fats into smaller molecules”, “bile, made in the stomach, (its origin in the liver being in the stem of the question) neutralises acids” or “lipase changes fatty acids into fats and glycerol/glycogen/glucose”. Also a common error was to state that bile was or contained an enzyme. A significant number of responses combined the actions of the two substances without identifying which substance was responsible for which action.

(b) Candidates should be aware that fatty acids and glycerol enter the lymph system and not the blood system when absorbed in the small intestine. Many responses listed all products of digestion as passing directly into the blood. In part **(ii)** a significant number responded about the digestion of carbohydrates and proteins, either as their complete answer or as part of a more extensive response. This meant that either they ignored the instruction to explain the role of the liver or that they believed that the liver has a direct role in these digestive processes. Candidates should have commented on the liver’s role in storing glucose and its role in the deamination of excess amino acids, not proteins.

Question 8

(a) It was expected that candidates would be able to orientate the heart diagram by reference to the difference in thickness of the walls of the ventricles. Many named **A** and **B** correctly and identified **C** and **D** as the vessels carrying oxygenated blood. However some errors repeatedly occurred with confusion between the pulmonary artery and the pulmonary vein, and also responses in which vessels linked to both sides of the heart carried oxygenated blood.

(b) This section again offered evidence of lack of careful reading of the question as many responses to part **(i)** were about actions unconnected with adjusting the diet, while in part **(ii)** there were frequent references to such dietary adjustments. Most candidates appreciated the value of reducing the intake of fat, cholesterol and salt and increasing the intake of fibre. Some candidates responded by naming specific foods that should be avoided. Also most identified dangers such as smoking, stress and lack of exercise.

Question 9

(a) Few candidates could state clearly and concisely what was meant by each of the terms. Candidates should be aware that addiction is where withdrawal from the drug causes unpleasant symptoms so that there is a continual desire, a craving, to take the drug. Also they should be aware that a depressant is a drug that depresses brain activity and slows down the nervous system. It is not, as many candidates believed, a drug that cures or alleviates the symptoms of depression. There was a lot of confusion of the long term effects on the body. Alcohol, in common with many other drugs, has a multiplicity of both short and long term effects. Among the long term effects are liver damage (cirrhosis), brain damage, gastritis, stomach ulcers and malnutrition. A popular misconception among candidates was that alcohol had direct major effects on the kidneys and the lungs. Many responses were over dramatic, such as “alcohol kills the liver or kills the brain”, when the effect is really on individual cells or clusters of cells.

(b) Most candidates gave responses based on a correct understanding of the effect of alcohol on driving but very often their answers were rather vague and failed to gain credit. The slowing of reactions, visual disturbance, reduced powers of judgement and a lack of inhibitions were commonly mentioned. However candidates should be careful in the wording of their answers as many of them seemed to think that “a reduced reaction time” had the same meaning as “slower reactions” when in fact it has the opposite meaning.

Paper 0610/03

Paper 3 (Extended)

General comments

The general impression of Examiners was that candidates performed slightly better than those taking this Paper last year and only a few were unsuitably entered for it: a full range of marks was observed, with fewer candidates at the lower end of the range. Their work was legible and the meaning clear for almost all of their answers. Spelling tended to be good and biological terms were used appropriately. There was no evidence that candidates were short of time. It was good to see evidence of planning by many candidates before they attempted the ***Section B*** questions.

Most had learned the facts adequately, but were not always able to apply this knowledge to answer the questions, resulting in too much irrelevant detail. Often, answers in ***Section A*** lacked succinctness, with answers continuing in margins and at the bottom of pages. Candidates need to plan their answers mentally before committing them to paper. The ability to draw and plot graphs was generally good, as was calculation – often done without the aid of a calculator. Where candidates attempted a question involving experience of practical work, such as **Question 4**, there was little evidence that they had ever performed or even observed such an experiment. Where diagrams were used to support answers, annotation was usually inadequate.

Comments on specific questions

Section A

Question 1

(a) The majority of candidates began very well and scored full marks. A good range of feasible suggestions was seen and accepted, including the provision of food and oxygen, camouflage from predators and a place to lay their eggs. Some answers, such as ‘It is their habitat’, were considered to lack sufficient detail to be merit-worthy.

(b)(i) The concept of plants respiring constantly was missed by all but the best candidates. In the explanation for each tube, one mark was available for stating the process or processes involved; a second for referring to the appropriate change in CO_2 level that resulted in the indicator colour observed. Most candidates coped with tubes 1 and 2, but had greater difficulty explaining why the indicator in tube 3 had remained red. The changes in tubes 4 and 5 also resulted in a range of incorrect answers. Some failed to grasp the significance of the black paper or the number of snails. Many answers for tube 5 were biologically incorrect because of a statement along the lines of 'There is no light, so the Elodea starts to respire'. Some weak candidates referred to changes in oxygen levels throughout their answers, despite the information given in the stem about the influence of CO_2 on indicator colour.

(ii) Too few candidates were aware of the use of a control in such an experiment and only a small minority could explain its use. Confusion with a fair test was common.

Question 2

(a) Labelling this diagram should have been straightforward but, nevertheless, errors occurred. Examiners were looking for names of cell parts rather than more specific sperm features such as a crosome or chromosomes. Inevitably, some plant cell features such as cell wall and vacuole appeared in weaker answers.

(b)(i) Most correctly gave haploid here. The most frequent error was in stating meiosis.

(ii) Two marks were available for defining a chromosome as a strand or thread of DNA, made up of many genes. DNA and genes were key terms in this definition and too many answers lacked one or both.

(c) The majority of candidates scored at least some marking points. The main problems seen were the omission of parental phenotypes to link up with their genotypes (and lack of parental genotypes in some punnett squares), inaccurate lines linking gametes to F1 genotypes and incorrect parental genotypes (for example, YY for male). Some candidates had no clear idea of what ratio would be produced. It seems candidates who use punnett squares tend to make fewer errors when applying this method of displaying a genetic cross.

Question 3

(a) The mean length, mean change in length and percentage change in length were usually calculated accurately. A few candidates omitted the minus signs.

(b) The majority of graphs were plotted well. Where marks were lost it tended to be due to a lack of labels or units. Candidates who made errors in their calculations were not penalised a second time when plotting these figures. Some graphs were poor, with the axes transposed, inadequate x and/or y scaling and sketchy lines linking the points. Sometimes the y scale was reversed for negative values.

(c)(i) This was not usually answered well. The units were often omitted and the value was frequently misread, even when the graph had been plotted perfectly.

(ii) Explanations tended to show a lack of understanding of osmosis and few stated that there would be no net movement of water since the concentration inside the potato cells would be the same as the surrounding solution. Answers were often biologically incorrect due to references to the movement of sugar molecules by osmosis.

(d)(i) Many candidates tried to use the graph to identify the most likely incorrect reading, although the question clearly referred to the table. The correct answer was piece one in 0 mol sugar solution.

(ii) Few recognised that this inaccuracy would result in the percentage change in length being lower than it should have been.

(e) Far more candidates than expected failed to gain two marks in this section of the question. While most were able to give one benefit of osmosis to plants, there were too many vague and unqualified references to transpiration or to movement of water through the plant. Two roles of water were sometimes offered. A common misconception was that mineral salts and sugars move by osmosis.

Section B

Choices varied from Centre to Centre, but the majority of candidates chose **Questions 6** and **7**. **Question 4** was slightly more popular than **Question 5**. Most followed the rubric of the paper and selected two questions to answer.

Question 4

This was generally answered poorly, with lengthy descriptions containing few marking points

(a)(i) Many candidates described the transpiration stream rather than the process of loss of water vapour from the leaves of the plant through the stomata. Very few answers mentioned the role of diffusion.

(ii) A small minority of answers reflected the candidate's own experience of an experiment to measure transpiration. Many versions were confused with photosynthesis in pond plants. Experimental details were nearly always lacking, apart from ways of creating two different temperatures. Even then, other variables were often unintentionally introduced: a fridge for cold temperature would mean the plant would be in darkness while the plant placed in a sunny place for heat would obviously have light; a hair dryer used to provide heat would also introduce air movement. Too often it was suggested that two (or more) plants or cuttings be used – introducing yet another variable: the question stated that one shoot or small plant should be used. Many answers involved trying to collect the water given off by the plant rather than measure the loss in mass. Almost no examinees successfully dealt with the concept of rate. Where they mentioned a time scale it was often inappropriate.

Successful answers tended to involve either a weight potometer or a bubble potometer. Most candidates did recognise that the rate of transpiration would be faster in hot conditions.

Candidates need more opportunities to plan such experiments, identifying variables and deciding how to control them and developing designs that are workable. Secondary information in text books does not provide this form of learning.

This part was answered best but, even so, very few candidates achieved full marks here. Although they knew the outlines of wilting, this was rarely linked successfully to the loss of water leading to cells becoming flaccid and, thus, loss of rigidity. Weak candidates discussed loss of minerals or poor photosynthesis.

Question 5

Although infrequently chosen, there were some very good answers, gaining high marks for all sections.

(a)(i) While good answers were seen, a common mistake was in confusing nitrogen fixation with nitrification and decomposition. Too much information about the nitrogen cycle was frequently given, straying well away from the remit of the question. While nitrogen fixation and feeding by herbivores were usually given, details of nitrate absorption by roots and digestion of plant protein by herbivores were often omitted. A common misconception was that amino acids are synthesised into protein (in the liver or elsewhere), then the proteins are transported in the blood to the muscles.

(ii) Most managed to state at least one or two uses of proteins in mammals. Growth, repair, enzyme and hormone formation were all commonly stated.

(b) Again, good responses were seen here, with most candidates knowing the importance of magnesium ions in plant growth. Fewer were aware of the term chlorosis, although adequate descriptions were given instead.

Question 6

This question was the most popular, with most candidates selecting it achieving reasonable marks. Answers tended to be kept brief and to the point, with adequate details. However, a few gave more than one example for each method. In such cases, Examiners mark the first answer offered and candidates penalise themselves by time-wasting when they could be better employed planning answers to other questions. Throughout the question the terms menstruation and ovulation were often confused, as were ovary, ova, ovule and oviduct.

(a)(i) Most candidates chose to cite the rhythm method. Few described how it depended on an understanding of the particular woman's menstrual cycle pattern. Vague remarks about avoiding intercourse around ovulation were common and there was some confusion between the rhythm method and withdrawal.

(ii) The use of the oral contraceptive pill was most often described. Some stated that it altered the level of hormones without recognising that they were contained in the pill. Sometimes the pill was confused with the morning-after pill.

(iii) The most frequent method described, usually accurately, was the condom. IUDs were sometimes thought to be surgical, possibly because of the need for intervention by a doctor.

(iv) Sterilisation was described for either sex. There was some confusion about what was meant by 'tying' the tubes, though most answers were accurate. Some references described only the cutting of sperm ducts or oviducts, without any reference to tying or sealing.

(b) This tended to be answered well, with many candidates able to name binary fission as the process involved and state that it is an example of asexual reproduction. Unfortunately, while some were aware that mitosis was involved, they went on to describe (and draw) this as in an animal cell – with nuclear membrane: they forgot that bacteria do not have a nucleus. Weaker candidates could only give vague and inadequate references to cell division.

Question 7

Again, this was a very popular ***Section B*** question, with many good answers marked.

(a) Full marks were often achieved here and most were able to give at least two or three correct comparisons. Virtually all candidates constructed the table satisfactorily. It is important that candidates take note of the marks available for this type of question: in this case Examiners awarded one mark for a properly constructed table, then four more for correct comparisons. However, they are instructed to treat answers as a list and only the first four are considered. Comparisons should also be opposite each other, rather than being given in random order, independently for artery and vein. Some answers were too vague, with unqualified terms such and wide and narrow, thick and thin, oxygenated and deoxygenated being regular weaknesses. Indeed, descriptions of wall thickness and lumen size tended to be poorly expressed.

(b) Although there were some excellent answers, the majority failed to gain full credit. The wall thickness and lumen size were not explained sufficiently clearly in many cases, so gained no marks at this point. For example, answers referred to the capillary being one cell thick without giving further details. Few were aware of the high pressure, the role of diffusion, the large surface area of capillaries or slow flow rate.

(c)(i) The movement of blood through the double circulatory system was clearly known by most, with many outlines gaining full marks with ease. Occasionally, chambers of the heart were confused.

(ii) Only the best candidates achieved marks here. Few referred to the importance of maintaining blood pressure or keeping oxygenated blood separated from deoxygenated blood.

Paper 0610/04

Coursework

General comments

The majority of Centres submitting coursework samples for moderation continue to produce excellent work. Most use between 7 and 12 tasks, chosen so that between them they give candidates plenty of opportunity to demonstrate their abilities within each of the four skill areas.

The tasks used for Skill **C1** assessment vary widely; almost every piece of practical work can be used to assess this Skill. For Skill **C2**, most Centres include at least one piece of work involving observation and drawing - sometimes including microscope work, and sometimes larger specimens such as flowers, fruits or seeds - and at least one involving the collection and recording of quantitative results - for example cooling curves, enzyme practicals or investigations on respiration in yeast.

For Skill **C3**, these quantitative investigations prove most useful, as they give the best opportunity for processing results and commenting on anomalous results and sources of experimental error. The latter is probably the most difficult component of all of the four Skills, and it is very pleasing to see so many candidates now tackling this with confidence.

Skill **C4** tasks vary widely, with some very imaginative ideas coming from some Centres. Most, however, stay with tried and tested experiments such as investigating the optimum temperature for seed germination, comparing the rate at which yeast respires two different sugars or investigating the factors that affect heat loss from a body. In the majority of cases, Centres present candidates with only two opportunities for Skill **C4**, as this is time-consuming. It is clear, though, that candidates get a great deal out of these exercises, beyond the production of a piece of coursework.

In the great majority of cases, the mark schemes drawn up by Teachers are excellent, relating clearly to the syllabus criteria and presented in such a way that they can be readily applied to the candidates' work. Most use descriptors, written for levels 2, 4 and 6, but some choose to use tick lists for Skill **C1**; a few also use tick lists for the other Skills. In a few cases, these tick lists do not quite work in matching performance to criteria, and this does seem to be more successful when descriptor mark schemes are used. A few Centres also have problems in ensuring that their mark schemes do not include components which do not belong with a particular Skill, such as including an assessment of results tables and graphs when assessing Skill **C4**, or conclusions and evaluations when assessing Skill **C2**.

Paper 0610/05

Practical Test

General comments

Supervisors are urged to read the instructions carefully and to open them as advised by CIE. In this paper germinating seedlings were required and they had to show a certain number of leaves. The seeds should have been germinated as advised and then further batches could have been grown if the original batch was unsuccessful. Seeds should be germinated in warm and moist conditions. If difficulties occur, Supervisors must give detailed comments and explanations in their report. Some Centres did experience difficulties, and where there was a valid explanation, such problems were taken into account. Similarly, Visking tubing was required for **Question 1**. There were Centres that did not supply Visking tubing and no reason was given. This puts the candidates in a difficult position. If an item is unavailable Supervisors must contact CIE in advance where advice will be given.

Question1 proved to be the more difficult question as some candidates tended to comment on osmosis instead of concentrating on fermentation.

Question 2 was generally answered well, but the quality of observation and drawing was variable. Some candidates had been well trained.

Comments on specific questions

Question 1

(a)(i)(ii) This question was generally well answered.

(b) If candidates moved the tubing up and down too vigorously, there would possibly have been leakage, resulting in a loss of volume. Most Centres correctly noticed an increase in volume.

(c) Not enough candidates mentioned the particulate nature of the contents of the tubing, but most candidates recognised the smell of alcohol or of unbaked bread.

(d) In spite of detecting the smell of ethanol in **(c)** and of noting the presence of carbon dioxide, some candidates tended to concentrate on osmosis, rather than fermentation. There were some very good answers however, where the products of fermentation were referred to as well as the effect of carbon dioxide on lime water.

(e)(i) No problems were encountered here.

(ii) Yeast is a fungus and not a bacterium as several candidates seemed to think. It contains enzymes but is not an enzyme itself. These enzymes help to control the processes that occurred in the experiment. Most candidates appreciated these facts and there were some good answers.

(iii) There were some very good answers to this question with clearly explained concentration gradients mentioned and the relatively small size of the glucose molecule. There were too many candidates who believed that glucose moved across the membrane by osmosis.

(f) There were some quite good explanations about what might happen at a higher temperature, although some candidates failed to give full descriptions of what would not then occur, e.g. there would be no ethanol produced.

Question 2

(a) In spite of some less than ideal specimens provided in some cases, the majority of candidates managed to draw some reasonable seedlings and, in general, were not penalised for the quality of their specimens. Candidates are urged to use the hand lens. It was disappointing to see how many candidates drew inaccurate representations of the specimens in front of them. Etiolated shoots have narrow stems. This was often referred to in the table in **(b)** but was not drawn in **(a)**.

(b) There were some good answers to this question, but there were candidates who referred to roots, when shoots were clearly required.

(c) There were no real problems for candidates who were well prepared.

(d)(i) There was a tendency for candidates to draw very small seeds if small seeds had been provided. This is not expected - even small seeds can be drawn quite large if the hand lens is used correctly. There were some excellent drawings, large, clear and fully labelled.

(ii) Candidates must use the hand lens to distinguish the internal structures such as the plumule and radicle. Many candidates drew large clear diagrams, but confused the plumule with the radicle when labelling.

(e)(i)(ii) (iii) Some methods of measuring leaf area, such as length x breadth when the leaf shape is triangular, are unacceptable. Many candidates were unable to give correct units, even though the grid was clearly printed and they were provided with a ruler.

Paper 0610/06

Alternative to Practical

General comments

The candidates entered for this paper showed a wide range of abilities. Many scored high marks and showed a sound knowledge of practical skills with an ability to express their understanding and biological knowledge clearly and concisely. Overall the standard of written English was high and there were comparatively few spelling errors. The drawing skills were well shown. The graphical part of **Question 3** was well answered by most candidates using data from a tally chart.

Most candidates correctly used a pencil to draw and to construct their histograms in this examination session. The number attempting these parts of the paper using an ink pen or ball point is decreasing. There were only a few instances where correcting fluid had been used.

It is important that candidates read carefully through the introduction to the questions and follow the rubric exactly.

It appeared that most candidates had sufficient time to complete the paper.

Comments on specific questions

Question 1

(a)(i) This question was based on the metabolism of the yeast, respiring anaerobically and releasing carbon dioxide. This gas would form small bubbles on the inside of the Visking tubing and the tubing would increase in size, then the gas would diffuse through the walls to the outside. The limewater in the beaker would change and become cloudy as the gas passed through the wall of the tubing into it.

Many candidates described the processes involved correctly but several candidates failed to refer to the observations which could be made.

However, some candidates associated the use of tubing with osmosis and this idea incorrectly influenced their interpretation of the question.

(ii) The question required the metabolic process responsible for the changes to be named. Although, many candidates correctly stated either fermentation or anaerobic respiration, others gave non-metabolic processes such as osmosis or diffusion.

(b)(i) The results of the biuret test for protein given in Table 1.2, indicated the presence of protein inside the tubing but none outside in the beaker. The limewater had been replaced with distilled water for this part of the investigation.

The explanation, based on the large size of the protein molecule preventing its diffusion through the wall of the tubing, was accurately described by many able candidates. The source of the enzyme was not required in this question though many candidates failed to link the idea that yeast is a fungus and can secrete enzymes outside the cells for extra-cellular digestion.

(ii) This part of the question referred to the reducing sugar conclusions in Table 1.2. The whole range of positive colours for the Benedict's test, was accepted from green to red-brown.

Some candidates do not know the food tests which are mentioned in the syllabus and much confusion was noted between the positive colours for the starch and protein tests.

(iii) Many candidates gave explanations referring to the sucrose being broken down by enzymes, from yeast cells, to glucose and fructose, that these are reducing sugars and that the molecules are small enough to diffuse through the walls of the tubing.

Some of the errors noted included the movement of sucrose through the walls of the tubing or the movement of glucose was due to osmosis, the sucrose was broken down by respiration and others that the limewater interfered with the diffusion of glucose even though the limewater had been replaced by distilled water.

Question 2

The syllabus for 2002 includes the group molluscs. (Section1.2.core)

This is the first time this group has been examined and it was obvious that many candidates had covered this group but not all.

(a) Fig 2.1, showed the outlines of three snails and candidates were asked to select one of these to illustrate the main features and to label two of the distinguishing features.

Most drawings were larger than the original and most candidates followed the rubric. The proportion of the body to shell was accurate in most good drawings though this detail was lacking on the poor drawings and often the shell pattern was muddled. There were some candidates who failed to follow the rubric and drew different animals of which some were other molluscs or members of completely different groups.

The two label marks were awarded to variable features. The most common features to be selected were the shell or exoskeleton and the foot or non-segmented body. Many incorrectly labelled the tentacles as antennae.

(b) Although most candidates, who had covered the group gave the name, molluscs, (various spellings), many incorrectly gave arthropods or crustacean.

Question 3

(a)(i) Most candidates expressed an idea about the importance of roots and water uptake. (syllabus 7.1.1). The question required comments on the appearance of the seedlings shortly after transplanting which was intended to eliminate reference to growth and effects of mineral deficiencies.

If the roots were damaged then the immediate effect on the seedling was lack of water so the seedling would wilt. Alternative wording describing this effect was given credit. Similarly if the roots were not damaged then the seedling would be upright with leaves supported as shown in Fig 3.1.

Some candidates failed to read the question carefully and concentrated on the root damage rather than the appearance of the seedling whose roots were damaged or not damaged. Some described other functions for roots such as anchorage.

(ii) There was a range of visible structures illustrated on the seedling in Fig 3.1 for candidates to select two dicotyledonous characteristics. Most candidates referred to the network of veins on the leaves and the two cotyledons which were still attached. Some candidates referred to the absence of such structures as no parallel veins on the leaves or to structures which were not visible such as a tap root.

(b) The background of squared paper behind the outline of the leaf was intended to aid the candidates in determining the area of the leaf. Many candidates correctly counted, either the larger 1 cm^2 squares and deducted the number of smaller squares which were not covered, or, the mm^2 squares, firstly the whole ones and then the parts. Some candidates estimated the rectangular size and failed to deduct the squares which were not covered.

(c)(i) The tally chart was completed correctly by most candidates using vertical or slightly oblique strokes instead of numbers. A few candidates still use five vertical lines instead crossing through a row of four with an oblique fifth line.

(ii) The candidates were requested in the question to draw a histogram to plot the frequencies for the continuous leaf area data in the tally chart for sun and shade leaves.

Many candidates constructed the histograms accurately and neatly in pencil gaining full marks, using either of the following methods:

[a] separate columns of equal width alternating along the horizontal '*x*' axis; or [b] superimposed columns for the classes showing data from both sets.

The five marks were allocated as:

A for axes labelling; for '*y*' or vertical axis, *frequency, tally or number* and for the '*x'* or horizontal axis, *class size in* cm^2 ;

S for scale the axes should be equally spaced to cover the range of data, suitable to fill more than half of the printed grid;

P for plotting the data from the tally chart accurately;

K for the correct use of a key to distinguish between the sun and shade leaf size;

C for the equal width and even spacing of the columns. The columns should be drawn in order of increasing magnitude and should be touching.

Amongst the common errors noted were: **A** the axes were not labelled or units missed; **S** two separate histograms were drawn instead of one or a small scale filling a ¼ of the printed grid; **P** linking values together or incorrectly plotting values from the tally chart; **K** keys were given but the shading or symbols were reversed; **C** different widths for columns or spaces between columns.

(d)(i) Only a few candidates made suitable suggestions on the basis of using the same type of leaf, the same species, the same age of leaf by selecting the third or fifth leaf back from the growing tip or recording more than fourteen leaves from each site.

Many candidates did not understand what needed to be controlled to ensure that the difference between the two sets of data was due solely to environmental factors.

(ii) The leaves from the shaded area had the larger leaf area to capture more of the available light for more photosynthesis. Many candidates expressed this idea in various ways.

Some candidates incorrectly linked the larger leaf area with transpiration or auxin activity.

Question 4

(a) Most candidates, even if they were unfamiliar with the apparatus, shown in Fig 4.1, described how the apparatus could be used to measure lung volume. After breathing in, the gas exhaled or breathed or blown out through the tube would displace the water in the inverted bell jar and the level recorded using the scale on the side would give the volume of air from the lungs.

Some candidates just breathed in and this would suck in the water which would achieve nothing other than getting a mouthful of water. Similarly breathing in and out would not achieve the desired result.

(b) Most candidates were able to suggest three factors that might influence the lung volumes of individuals of the same age. The mark scheme linked similar factors together such as body mass or size; fitness and training; life style; lung diseases; smoking. A few candidates failed to read the question carefully and gave age as one of the three factors whereas this was the controlled factor mentioned in the stem of the question.

(c) A wide range of experimental approaches were suggested for this investigation to compare the carbon dioxide concentration between exhaled air and inhaled air. Many candidates described the 'huff-puff' apparatus using either limewater or hydrogen carbonate indicator to compare the rate of colour change in the two samples. Others suggested suitable means of collecting the two samples using pumps, gas syringes and showed great ingenuity of ideas.

Some suggestions used carbon dioxide absorbing substances and compared the increase in mass.

The suggestions were marked according to firstly the basic principle of the method, secondly would the method work in practical terms and thirdly would the test show the expected result.

Unfortunately many suggestions were not possible. The gas stream apparatus shows that carbon dioxide is given off by respiring organisms, plant or animal, but does not compare inhaled and exhaled air as the gas flow is in one direction only. Use of lighted splint is the test for oxygen not carbon dioxide. Growth of plants in normal air and exhaled air would be influenced by many other factors.

Some candidates are still under the misconception that inhaled air is oxygen and exhaled air is carbon dioxide. Some of the candidates only described the thoracic structures involved with the breathing process such as diaphragm and rib cage, instead of suggesting a practical experimental investigation to show the difference in carbon dioxide levels in inhaled and exhaled air.