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BIOLOGY

Paper 0610/01

Multiple Choice

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General comments

Statistically, this year's Paper proved to be one of the most satisfactory tests of recent years. There was a wide and relatively even spread of marks (from 13 to 40 out of 40). All questions were answered correctly by at least half of the candidates, except for **Question 31** which failed to achieve this by a mere 1%, and only four questions were not correctly answered by over 60% of the candidates. The degree to which all questions discriminated accurately between candidates of varying abilities was unusually high with only **Question 35** just failing to reach the statistical objective.

Comments on specific questions

Question 1

This was the easiest question on the Paper, but it accurately tested the important Biological skill of following an identification key. It was sufficiently demanding for those lacking in this requirement, or simply lacking in the care necessary for the application of the skill, to defeat a small number.

Question 14

Option **D** attracted several candidates who had some knowledge and applied logical though faulty reasoning. As a result, they were persuaded that spongy mesophyll cells being nearer the stomata, absorbed more carbon dioxide during the day than the palisade cells.

Question 21

The problem here for about one fifth of the candidates was failing to realise that the question w anaerobic respiration *in yeast*. Thus they opted for energy remaining trapped in lactic acid rathe ethanol. It was perhaps surprising that a further fifth of the candidates were way out in thinking that energ lost in carbon dioxide.

Question 31

Although this proved to be the most difficult question on the Paper, this is not unusual for a genetics question where an element of muddled thinking, can so often set in. All incorrect options were equally popular suggesting that guesswork played a large part for the less able whilst the better, and thus more calm and confident candidates did not experience problems.

Question 35

This question was found to be on the difficult side by a small number of generally competent candidates. Perhaps understandably, they found problems with deciding whether condensation occurs during cloud formation or when clouds precipitate their water in the form of rain.

Question 36

It was a little surprising that 20% of the candidates should believe that nitrogen is a gas which is released directly from trees and from sheep. A further 21% thought that carbon dioxide is released by a tree in sunlight (and which is therefore photosynthesising). It was clear that those who were prepared to think carefully through the problem experienced few difficulties.

Paper 0610/02

Paper 2 (Core)

General comments

The overall standard of responses suggested that virtually all candidates found all the questions accessible and that they had sufficient time to complete all questions. The only part that was not always responded to was **Question 5 (b)**. There was usually good use of appropriate biological knowledge, understanding and terminology.

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 “Suggest two other features …..” then their response is not enhanced by offering more than two answers. There was evidence that candidates made use of the clues given by the answer space size and the allocation of marks to tailor their responses appropriately.

Comments on specific questions

Question 1

(a) Identifying three other characteristics did not present a problem to the vast majority of candidates. However a few failed to realise that respiration was excluded by the stem of the question and some offered terms that were specific to one group of organisms, such as transpiration, plants, breathing, animals with lungs and feeding or digestion, animals in general. Dying is not normally considered to be a characteristic of living things.

(b) The majority of candidates tackled this by trying to investigate the production of carbon dioxide, probably the best approach. They regularly attempted to pass air from the sample of mud through limewater, or occasionally through hydrogencarbonate indicator. Other approaches received credit but very often the suggested procedures were unlikely to work and normally did not demonstrate respiration was occurring. These methods often attempted to show feeding or reproduction.

Question 2

(a) Identifying the two, labelled structures did seem to give a significant number of ca problems. Sometimes the names of these structures were reversed but not uncommonly they totally misidentified as leaves, seeds, feathers etc. When dealing with a feature that suggested flower was wind pollinated the confusion over these structures was extended. Anthers were thought to collect pollen while the stigma released it. In other responses the wind was thought to disperse the stigma or anthers and even the hairs on X. The majority of candidates identified two suitable differences between the sugar cane flower and an insect pollinated flower. It should be noted that those who offer more than two features risk losing some of the credit available for the section if any of the features given are incorrect.

(b) A significant number of candidates appeared to find difficulty in describing the direction the wind was coming from and instead gave the complete opposite. Also many only spotted the higher frequency of fruits in either the north or the east and not both. A wide range of suggestions of factors that could affect the distribution of the fruits was offered but too often they were rather vague or ignored the information given. The question stem identified the fruits as being winged and to suggest that they were carried in the fur of animals and even birds or insects was not considered credit worthy. A number of candidates introduced irrelevant ideas such as conditions necessary for germination or competition between seedlings.

Question 3

(a) Most candidates had a very thorough understanding of the carbon cycle but the pair of parallel arrows between “carbon dioxide in the air” and “green plants” gave rise to some confusion between photosynthesis and respiration. A few candidates tried to overcome this by placing both letters between these two arrows and equidistant from each. The question requested the labelling of a single arrow for each process and if candidates labelled more than one arrow for a particular process all responses for that letter had to be correct to gain the credit.

(b) Overall candidates seemed familiar with both cycles and the effects of deforestation on them but very often responses were limited in depth and candidates only gained part of the credit. Candidates should appreciate that effects on either cycle do not include consequences of these effects. Responses about global warming, flooding, soil erosion and desertification are not effects on the cycle. Candidates should also be aware that carbon and carbon dioxide are not synonymous terms.

Question 4

(a) Candidates frequently gained full credit but occasionally the cell wall in the plant cell was identified as being the same structure as the membrane in the animal cell.

(b) Most candidates were familiar with differences between the animal cell and a red blood cell and the function of such a cell. Knowledge of the cells lining the trachea was poor and only a limited number referred to ciliated epithelial cells or goblet cells, the former clearly being noted in the syllabus. Cilia were apparently thought of as “hairs” and they were considered to trap or filter dust and bacteria. Candidates should be aware that dust and bacteria are trapped by mucus and that the function of the cilia is to move the mucus along the airway.

(c) Many candidates gained maximum credit for their definition and for identifying the differences between osmosis and diffusion. The correct idea that both processes occur down a concentration gradient was common in both responses. Common errors were to consider that diffusion had to have some sort of membrane to occur and to refer to the movement of substances rather than molecules or particles. Also diffusion was often considered to only affect gases.

Question 5

(a) A significant number of candidates gained full credit in this section. There was the inevitable confusion between mitosis and meiosis and haploid and diploid but frequently the terms were correctly linked in pairs by candidates. It should be noted that normally spelling errors do not disbar candidates from gaining credit but when terms are very similar the spelling has to be correct. When terms are printed in a question stem misspellings of them are unacceptable.

(b) There are a number of alternative forms in which a genetic diagram can be prese[illegible] cases it is necessary to label or annotate the diagram so that its meaning is abso[illegible] Without this it is very unlikely to gain maximum credit. Candidates should be aware [illegible] convention is that the sex chromosomes are represented by X and Y and candidates shou[illegible] utilise other terminology. There were a significant number of candidates who dealt with [illegible] inheritance, not of the sex of an individual, but of some phenotypic character such as eye or ha[illegible] colour.

Question 6

(a) The commonest error was to confuse egestion with excretion.

(b) The commonest error in this section was to indicate that bile was produced in the gall bladder when this only stores it after production. Candidates who did not use label lines to indicate the relevant site but instead wrote the subsection number on parts of the diagram often covered more than one site and thus gained no credit.

Question 7

(a) There was very limited knowledge and understanding demonstrated in responses to this section of the question. Candidates tried to name the labelled parts when this was not requested and in doing so in many cases misled themselves in stating the relevant function. The commonest correct response was that for C. A common misunderstanding was that the cornea's, A, function was to protect the eye by keeping out dust, bacteria and insects. Very many stated what the retina was composed of but failed to identify its function. Those who did attempt this used terms such as "passing messages" which is considered not to be creditworthy. Candidates should refer to nerve impulses instead.

(b) Many candidates realised that too much light would enter the eye and suggested that vision would be blurred or the retina would be damaged. However many others suggested that this would sharpen the image. Some mistakenly developed the reference to drugs and discussed the effects of drugs on the body in general.

Question 8

(a) Far too many thought that translocation was the movement of anything within the plant via both the xylem and phloem. Candidates should realise that translocation involves the movement of soluble nutrients such as sugars or amino acids from supply to demand, points made by more able candidates. Most understood that transpiration was the loss of water vapour from leaves or stomata.

(b) The responses were very mixed and many tried to relate this to osmosis and the uptake of materials by root hair cells when the investigation showed only a leaf and its stalk. Many others thought that diffusion was the main force involved. Those who recognised that the movement was of water with the soluble dye linked this to the xylem vessels and transpiration.

Question 9

(a) The majority of candidates identified at least one relevant form of energy but there were significant numbers of imprecise responses such as solar rather than light energy and food rather than chemical energy.

(b) Nearly all candidates identified a relevant group of organisms such as bacteria or fungi but there were a few who tried to be more precise and identified a wrong type of bacterium disqualifying their answer. Few responded in too general terms with answers such as decomposer. Many realised that all of the energy in the ecosystem eventually becomes heat energy.

(c) It would appear that most appreciated the concept involved but too often they responded in such a way as to really repeat the stem of the question.

Paper 0610/03
Paper 3 (Extended)

General comments

As last year, a good standard of Papers were seen. The Paper discriminated well with a wide range of marks recorded, although really high marks were less frequent than in the previous session. The Paper was considered to be fair, with adequate time available and candidates followed the rubric in the instructions very well.

Candidates' work continues to be legible and well presented. The quality of spelling was variable and, while most biological terms were used appropriately, some - such as allele, antigen, antibody, semen and seminal fluid – need more careful explanation. Candidates usually handled unfamiliar information, such as that in **Question 3**, with confidence and were certainly not put off by it. Introductory information tended to be carefully read before answering the question.

Examiners were concerned that despite the instructions on the cover, sharp staples, paper clips and tightly tied pages often hampered the marking process. The use of treasury tags is by far the most effective way of attaching loose sheets to the Question Paper. Candidates should be instructed to record the numbers of the ***Section B*** questions they have answered in the box provided on the front of the Examination Paper.

Comments on specific questions

Section A

Question 1

(a) The diagram was not as well known as might be expected. While most candidates drew the urethra correctly, its labelling was sometimes confused with that of the ureter. Some tried to extend it beyond the body, although the question stated that the diagram was that of the female urinary system. Fewer were able to connect the ureter correctly to the kidney: in the majority of scripts it was drawn from the base of the kidney, while some had it attached to a blood vessel. Inevitably, some examinees drew and labelled the renal artery as a blood vessel arising from the vena cava. One mark was available for the quality of the drawing, which had to be accurate and with all three structures drawn as double lines.

(b) Most candidates managed to correctly name two out of the required three components correctly. The most common incorrect third answers included amino acids, carbon dioxide and glucose. Some Centres need to emphasise the rubric of answering this type of question: only one answer should be written on each line. Some candidates gave a list. In such cases the Examiner will not select the best answer from the list, but will automatically mark the first one offered. In other words, candidates cannot expect the Examiner to choose the right answer for them.

(c) The kidney machine was a mysterious black box for many candidates; its principles were not well understood, with candidates writing irrelevant information about why the machine might be needed, rather than how it works. Scoring maximum marks was achieved quite easily but, too often, blood was taken from a renal artery or returned to a renal vein, or blood was not even mentioned. The role of a pump and bubble trap were rarely included. Good candidates recognised the significance of the osmotic potential of the bathing fluid and the nature of the dialysis tubing.

(d)(i) Definitions tended to be sound. Where a mark was dropped it was usually because the candidate referred to maintenance of the environment rather than the *internal* environment.

(ii) This was less well done. Most answers failed to state the role of kidneys in regulating the levels of substances *in blood*. Often the substances were not identified, with vague references to poisons and wastes. Methods of regulation were rarely named or described. A common error was to describe urination as a form of temperature regulation.

(iii) The most popular organs chosen were the liver and pancreas, although a full range of choices also gained credit. Weaker candidates struggled to explain the role of their choice. For example, many of those who selected the lungs stated that oxygen and carbon dioxide were controlled, but could not state how their levels could be varied (by modifying the rate/depth of breathing). Those who chose skin or brain tended to have most difficulty with outlining function.

Question 2

The question was generally understood and answered well.

(a) The vast majority completed the graph accurately, shading the columns appropriately.

(b)(i) Most correctly stated 12%.

(ii) The correct answer was 88%. Some candidates omitted the percentage with no decay, resulting in a total of 38%, or omitted the percentage with five decayed teeth, resulting in a total of 92%. Others did not realise that the figures on the y axis were already percentages and went to elaborate lengths to calculate the total percentage.

(c)(i) Few candidates related their conclusion to children: general statements about fluoride preventing tooth decay were common. A surprising number suggested that fluoride causes tooth decay.

(ii) It was good to see fewer references to fluo*rine* than on previous occasions when the topic has been tested. Recommendations were usually sound, with a dosage of 2 parts per million included in the answer.

(iii) This was well answered, with most references made to cost and personal choice. However, many answers suggested that fluoride can make teeth go black. This is not the case: it can cause browning or mottling. The medical term is dental fluorosis.

Question 3

Candidates tended to cope well with the unfamiliar information in this question.

(a) Many examinees could explain the term binomial system well. A few put genus and species the wrong way round, used the term gene instead of genus, or made vague references to naming or classifying organisms.

(b)(i) Most understood the competition between Caulerpa and the local seaweeds. A few forgot that Caulerpa was a plant and referred to it eating the food of the local seaweeds. References to competition for food were not accepted. The term *plant food* needs to be avoided. Candidates should be using named minerals instead, keeping food in the context of heterotrophs, or a product of photosynthesis.

(ii) The majority of definitions were word-perfect. A small minority of candidates used terms such as greens and herbs instead of plants.

(iii) The better candidates wrote that carnivorous fish died because they had fewer herbivores to eat. However, many answers described the food chain and discussed drops in numbers without suggesting the cause (such as death or migration).

(c) The effect of chlorine on bacteria (in water treatment) was well known: candidates applied their knowledge well, or gave other equally viable suggestions relating to pollution or the damaging effect of chlorine on other organisms.

(d) All three sections were often marred by vague comments about ‘affecting organisms’. Candidates need to be encouraged to be more concise.

(i) Examiners were looking for references to possible effects on local food chains or webs, the destabilisation of the ecosystem, extinction of organisms, effects on the local fishing industry, tourism and so on.

(ii) Answers here were better than in **(i)**. Most stated that the sea slugs would eat the [illegible] allow the local seaweeds to grow again. Some missed the point and thought that the [illegible] would provide food for carnivorous fish. While this may eventually be the case, it certain[illegible] not be the intention of the conservationists.

(iii) Again, good answers were seen here, with many references to the possibility that the sea slugs may start to eat local seaweeds, causing their extinction or unbalancing food chains.

Section B

Choices revealed that **Question 7** was by far the most popular ***Section B*** question. **Question 6** was slightly more popular than **Question 5**. **Question 4** was least often selected, although some Centres had obviously taught both classification and evolution very well.

Question 4

This was generally answered poorly on balance: very few candidates scored full marks. Some had opted for the question because of their knowledge of arthropod characteristics. However, nearly half the marks were associated with part **(b)** - on the process of insect evolution, which usually drew weak responses.

(a)(i) Responses here tended to be less good than the differences in **(ii)**. Most could give two correct similarities (most commonly the presence of a segmented body and jointed limbs). References to both being invertebrates or arthropods were less often given than expected. Common mistakes were in stating that both insects and arachnids have antennae and compound eyes.

(ii) The majority of candidates constructed a suitable table. Differences in terms of number of legs, presence or absence of wings and antennae were most often correctly recorded. Many struggled to give more than two acceptable comparisons. The term *segment* was often used incorrectly, where *parts* or *sections* would have been appropriate.

(b) Very few candidates scored high marks in this part. Evolution was mistaken for metamorphosis, with lengthy descriptions of lifecycles of butterflies given. Many candidates tried to change the insect into something else in one generation: the concept of evolution was not well understood and natural selection rarely featured in answers. Others found it hard to organise their thoughts in a logical manner (planning the answer first would have helped). Successful responses tended to be based on knowledge of the peppered moth (Biston betularia), although one or two adventurous examinees developed feasible ideas of their own. There were occasional excellent answers where environmental change was seen as benefiting some individuals that varied in an appropriate way from their siblings.

Question 5

Many of the weaker candidates opted for this question, but they did not fare well from their choice.

(a) Too many responses lacked precision - containing vague remarks failing to match marking points on the mark scheme, even though there was plenty of opportunity to gain marks with 24 points listed. Repetition of the same points was common and there was a general failure to state the consequences of an effect. Many became distracted with issues of social injustice. However, some candidates wrote sensibly structured answers, revealing quite a good understanding of the issues and the ability to organise difficult material.

(b) Again, good responses were rare, probably because the candidate had selected the question thinking, erroneously, that he or she could gain a high mark on part **(a)**. There was often confusion between hormones and food additives. Others described the role of hormones in the human body. Good answers included the use of hormones in the control of fruit ripening or fruit production, the formation of seedless fruit, or as a weedkiller. A few candidates knew about hormone use to increase milk yields and meat production.

Question 6

(a) Candidates tend to think the term *gene* means the same as *allele*, making an explan codominance difficult. Good answers referred to a pair of alleles, neither of which is dominan the other, resulting in both alleles having an effect in a heterozygous organism.

(b) Most candidates worked through the genetic cross successfully using a mother of genotype I^AI^o and a father of genotype I^BI^o. Some threw away marks by not identifying the parents to which the genotypes belonged or not stating the gametes before displaying the cross or by not linking the offspring with blood group O with its genotype. The standard way of displaying a genetic cross is to use the following stages:

- phenotype of parents
- genotype of parents (with a cross between them to show mating)
- genotype of gametes (also with a cross between them to show mating)
- genotype of offspring (F1)
- phenotype of offspring (F1)
- This is still important even if a punnett square is used.

(c)(i) A surprising number of candidates struggled with this question. The terms *antigen* and *antibody* are not well understood in terms of location or effects. It was often stated that phagocytes produce antibodies. Even fairly basic concepts such as clotting or clumping were overlooked in some answers. However, some good answers included statements about no clumping occurring if the donor was blood group O.

(ii) This was answered better. Most recognised the role of the placenta in keeping the blood of mother and fetus separate in case they have different blood types, while allowing the exchange of materials.

Question 7

This was the most popular ***Section B*** question and many good answers were marked.

(a) Few managed to gain full marks in this section, mainly because important details were left out, particularly regarding the penis, sperm duct and urethra. Details about the function of the scrotum were often incorrect, usually through stating that it has a protective function. Epididymis was sometimes confused with epidermis. The difference between the terms *seminal fluid* and *semen* was not always understood. Occasionally non-reproductive or non-male parts such as bladder, oviduct and ureter were offered.

(b)(i) Good answers were seen here, although some candidates tended to merge parts **(i)** and **(ii)**, or include correct biological details in the wrong section.

(ii) Again, many good answers were marked, although it was common to see responses continuing beyond the question, giving detail of development from zygote into an embryo. The process of a sperm penetrating the egg membrane was not generally well known: answers sometimes described sperm bumping into the egg wall or membrane until it broke – implying that the egg has a shell. Candidates need to be aware that the male and female gamete nuclei need to fuse to achieve fertilisation.

(c) This was well known, although some very worrying misconceptions were recorded. These included the belief that reducing the number of partners, use of a diaphragm or use of the pill, washing the genitals or having a vasectomy would prevent the spread of HIV. Vague answers about not using another person's personal items gained no credit.

Paper 0610/04

Coursework

General comments

Many Centres have been entering candidates for this Paper for several years now, and they have developed a range of tasks which work very well. For most of these Centres, between 7 and 12 tasks seem to provide the right balance between giving candidates the opportunity to get feedback on early performance so that they can improve later, without spending too much time on assessment to the detriment of other areas of the course.

In all but a few instances, Centres choose to use tasks where just one or two skills are tested. A few assess skills 2, 3 and 4 together, but this tends to work well only where the Teacher is experienced and has a very firm grasp of the assessment process.

It is very pleasing to see the standard of work in many Centres continuing to improve steadily. More candidates are now showing an excellent understanding of their investigative work, in particular in looking critically at their methods and evaluating their results. These areas continue, however, to be major areas of weakness for others.

Some Centres new to this component have been a little less successful in providing appropriate opportunities for their candidates to develop and demonstrate their skills. For example, some have made only two assessments for each skill, which does not provide any chance of improving on a poor performance. Some Teachers have had difficulties in appreciating the way in which mark schemes should interpret the criteria in a way which relates specifically to the task being used for assessment, while others have written good mark schemes but then not applied them carefully to the candidate's work. It is strongly recommended that Teachers new to this Paper should not attempt to assess more than two skills on any one task to begin with. In particular, it is wise to assess skill 4 separately. This means that candidates are provided with a worksheet and method for tasks where skills 1, 2 and 3 are being assessed, which makes it easier for them and the Teacher to focus on these areas of their work.

Certain experiments feature regularly – for example investigating the effect of light intensity on the rate of photosynthesis, osmosis experiments using potatoes, respiration of yeast at different temperatures or with different sugars, transpiration or enzyme practicals. These are all good in that they provide quantitative results, giving very good opportunities to demonstrate skill 2 and skill 3 capabilities. Many Centres also use dissections (fish, hearts) and simple microscope work (leaf epidermis, cheek cells) to assess skills 1 and 2. Some take candidates outside, making use of the school grounds to investigate, for example, variation in leaves on different trees or from different areas or the distribution of fruits around a tree.

Paper 0610/05

Practical Test

General comments

It was interesting to note that candidates could perform well on either **Question 1** or **Question 2**, but rarely on both. This would explain why few candidates were able to approach full marks for the Paper as a whole.

Some Centres experienced problems with the preparation of the dough samples for **Question 1**. In general, it had been prepared too far in advance of the actual practical. Consequently, S1 had finished rising and was starting to collapse. The instructions had clearly stated that sample S1 should show an increase in volume over a 30 minute period and allowances should have been made for this in light of the results from previous trials. This did not, however, necessarily cause a problem for the candidates.

Some Centres found difficulty in finding snails, especially those in hot, dry countries. Candida... supplied with a picture might have been considered to have been at an advantage over those coping with live material, but the mark scheme tried to ensure that this was not the case. Centre... consider the likely use of such a photograph in the examination. At some point it is probable that cand... will be expected to draw a specimen and possibly calculate the magnification of such a draw... Consequently, a large, clear photograph would be desirable. Some Centres, however, supplied photograph... in which the specimen was so large that candidates were unable to draw a diagram that would be larger than the original. While this was not in itself a problem, when it came to calculating the magnification some candidates clearly experienced difficulty, expecting the answer to be greater than 1 whereas it was, in fact, less than 1.

Centres are reminded of the importance of completing the Supervisor's Report. Examiners make use of this when they encounter unexpected readings or results. It was particularly helpful on this occasion if Centres had advised about problems with the dough, use of biuret solution rather than the reagents specified in the instructions and lack of activity of specimen S4. Many reports were left blank this year and candidates failed to gain full marks in **Question 2 (a)(ii)** if the inappropriate method was quoted. Centres who had filled in the Supervisor's Report with the relevant information facilitated their candidates access to some of the marks.

Comments on specific questions

Question 1

(a) Some poor tables were seen, even when a ruler had been used. Candidates should understand that only one table is required, not two separate ones, and that a line should be ruled around the outside of it, encompassing all the headings. Headings were not always provided and a significant number of candidates failed to include units. A surprising number of candidates had not followed the instructions and only recorded for 25 minutes rather than the full 30 minutes.

(b) The standard of drawing of the graph was, in many cases, poor. Candidates need to be thoroughly instructed in the art of drawing graphs - i.e. using sharp pencils (many used pens or thick pencil, with resulting problems when they tried to erase writing, points or lines), small neat crosses or ringed dots for plots (so that they can be clearly seen), joining of the plots with a neat line drawn with a ruler. The scale and orientation of the axes also proved to be a problem. Candidates should be reminded that the controlled variable (in this case, time) should go on the *x* axis while the uncontrolled variable (in this case, the height of the dough) should be plotted on the *y* axis. A suitable scale should be chosen, one that allows easy plotting of the points and uses as much of the graph paper as is practically possible. A scale of 10 small squares representing 6 minutes was, for example, very difficult to use when readings were every 5 minutes even though this did utilise the whole of the x axis. Candidates should not ignore results simply because they do not fit onto the graph paper. A significant number omitted the initial reading or the 30 minute reading so that the scale would work easily. If two lines are being drawn on the same graph, they should be identified in some way. It was pleasing to note that most candidates made at least some attempt to label the axes. Axes should be labelled both with the parameter and the units used.

(c) Most candidates were able to make some attempt at describing the curves that they had drawn. Those who had experienced problems with the dough samples were not penalised as *their* results and graphs were judged, rather than those expected. Some, however, seemed to transpose S1 and S2 for no apparent reason.

(d) This part of the question discriminated quite well, with few candidates managing to gain all 6 marks. Even if they had achieved unexpected results, candidates appeared to be able to relate some of the theory. It was very much Centre biased whether candidates could provide a clear and reasoned explanation.

Question 2

(a)(i) Most candidates were able to indicate the correct colour and conclusion. Candidates should avoid writing ambiguous information such as 'dark purple' or 'purple/black'.

(ii) Most candidates scored well here, with the exception of those who stated that they had used biuret solution. As long as a suitable statement appeared in the Supervisor's Report (concerning the lack of availability of separate reagents and having contacted CIE) then such responses were credited.

(b)(i) Very few candidates drew undersized drawings, although some did not have a good
A significant number were unlabelled and it was clear that many had little idea of the co
for 'foot' and 'tentacles'. Marks are available for both drawing and labels, so candidates s
reminded to place labels on their drawings.

(ii) Measuring did, however, present candidates with problems. It was not always clear where the measurements had been taken, although those who had indicated the plane of their measurement ensured that the Examiner was able to check the measurement easily. Candidates should be aware that measurements will always be checked and that they are expected to indicate the units used. Many found calculating the magnification a challenge. The most frequent error was to turn the division calculation upside-down. The majority of candidates gave too many decimal places in their answer - a reasonable level of accuracy would have been to 1 decimal place. Surprisingly, even those who had performed the calculation correctly then put units in their answer and thus lost the mark. Compromising, by writing an answer such as 'x2cm', did not persuade the Examiners to award the mark.

(c) The application of principles required in answering this question proved difficult for some candidates. Essentially they were expected to put the snails in controlled conditions and then to vary the temperature. They were also expected to realise that the snail's temperature needed to be taken with a thermometer touching the soft part of the body to give an accurate reading. Some strange procedures were suggested, including putting the snails in a fridge, heating them with a Bunsen burner or inserting a thermometer through the opening of the shell. Surprisingly, a significant number of candidates forgot to mention that a thermometer should be used, even when they had a reasonable idea of a suitable procedure. For others, however, this was one of the few points that they made.

(d)(i) Candidates generally answered this well, giving full and clear descriptions, gaining full marks.

(ii) The majority realised that the shell was made of calcium carbonate. They were, however, expected to make the link clearly and some candidates lost marks because they answered in general terms, simply restating the information concerning the reactions of calcium carbonate given in the stem of the question.

(iii) Very few candidates failed to supply a suitable suggestion.

Paper 0610/06

Alternative to Practical

General comments

The candidates entered for this Paper showed a higher range of ability compared with last summer's entry. Many scored higher 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 sometimes not so good but there was an overall improvement in plotting the graph in **Question 1**. The number attempting these parts of the Paper using an ink pen or ball-point pen is decreasing.

It is important that candidates read carefully through the introduction to the questions and to follow the rubric exactly. Some candidates answered using theoretical knowledge instead of the information contained in the stem of the question.

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

The range of marks seen covered 0 to 40.

Comments on specific questions

Question 1

(a) Many candidates recognised and suggested two correct factors which had to be kept constant in the investigation. There were, however, a number who had not read the question carefully, ignoring the words *other factors* and repeated flour and water again. Some of the less able candidates listed all of the ingredients including substance X. Common errors included time and humidity.

(b)(i) The line graphs were well plotted by most candidates.

- Orientation – The axes were correctly chosen with the independent variable plotted on the *x* (horizontal) axis.
- Labelling the axes correctly with the appropriate unit was generally consistent with the column headings given in Table 1.1.
- Scale – Most candidates used over half of the 10 cm x 14 cm printed grid to plot the points with an equally spaced linear scale of 1 mm square for each cm^3 for the volume of the dough (vertical *y* axis) and each 1mm square for 2 minutes of time (horizontal *x* axis). It was not necessary to start the volume axis from zero and many candidates started the vertical scale from 10 cm^3.
- Very few candidates used different scales and where used these were carefully checked for accuracy.
- Plotting the points - candidates showed a careful and accurate skill in dealing with the three sets of data which had to be plotted using the same axes.
- Many candidates adopted the recommended procedure for multiple curves of clearly showing each of the set by distinguishing the points as encircled dots (⊙), saltire crosses (x) or vertical crosses (+) as well as including labels of separate keys. If the lines were labelled at the 120 minute point then it was sometimes impossible to distinguish between the line A and line C.
- The points should be joined by neat ruled lines to make the following parts of the question more straightforward. The lines drawn by many of the candidates were often inaccurate and curved between adjacent plotted points. A few candidates omitted to join the last two plotted points for line C between 100 and 120 minutes.

Only very few candidates did not attempt the graph. Very few histograms or bar charts were noted.

(ii) Many candidates failed to read the question carefully and did not describe the curves but anticipated the need to include an explanation. Those candidates who followed the rubric scored all three marks for describing - the line A rose steadily over the whole time - 120 minutes; line B did not rise or only very slowly and line C which rose quickly and then flattened at 80 minutes and stayed constant.

Common errors included the use of vague terminology such as ‘change’, ‘straight’ or ‘steep’ which did not describe the increase or constant volume accurately enough. Comparative answers such as line C was faster than line A which was faster than B merely compared rates and did not answer the set question. Many answers quoted the figures only reading off from the graph without an overall description.

(iii) Although there were many correct answers for 80 minutes, a wide range of units were given - cm^3, °C, seconds and hours. The common error noted involved those candidates who mis-read the question which asked ‘when’ in terms of time scale and their answers referred to the volume difference.

(iv) The explanation for the changed difference in the volumes of dough between samples A and B, involving the presence of yeast, production of carbon dioxide and the rising of the dough was well known. A common error was to refer to the rate of volume change and that the dough, of sample B, would eventually rise given a longer time period. A few candidates incorrectly suggested it was the role of ethanol production or that an enzyme was involved that accounted for the rate of change in volume.

(v) The explanation for the changed difference in the volumes of dough between sam involving the presence of substance X in sample C was well described in terms of ra Sample C increased rapidly in volume in a shorter time and then stopped increasing. Ca expressed the idea that substance X might be an enzyme, a catalyst or a rising agent. candidates expressed the idea that substance X inhibited the reaction because sample increased in volume to a certain point and then stopped increasing. Substance X in thi investigation was ascorbic acid, vitamin C which is used as a bread improver.

Question 2

(a) Most candidates were able to name two conditions necessary for germination correctly. The common error was to quote 'temperature' which needed to be qualified and secondly to quote 'light' as very few seeds are sensitive to light as a necessary condition for germination.

Many candidates failed to read the question carefully and gave water as a condition which was excluded in the question. Other incorrect conditions noted were carbon dioxide, air, minerals, humidity and soil.

(b) This part of the question was based on experimental planning skills. Many candidates described clearly in precise terms how they would investigate one of their chosen conditions on germination of seeds.

The points which were considered were, how this chosen factor might be carried through in practical terms to present one set of seeds with the presence of this and another set to exclude the same factor.

For example if a suitable temperature e.g. room temperature was to be compared with an unsuitable temperature e.g. in a refrigerator.

- Secondly, the need to include a number of seeds in the investigation, for repetition in case some were non-viable. A common error was to use a single seed only in each condition.
- Thirdly that all other conditions should be controlled such as an equal number of seeds, same species of seed, equal watering, etc.
- Fourthly, there should be a suitable time period for the germination process to take place.

Some candidates tried to investigate both of the chosen conditions in **(a)** so both were marked and the highest awarded.

There were many candidates who were not able to plan such an investigation and described the conditions that would affect germination but not in the context of organising and planning an investigation of their own.

Question 3

(a)(i) The standard of the drawing skills was not as high as previously noted, even though Fig. 3.1 showed a clear image for the candidate to copy. The outline of the drawings was clear and generally less sketchy than previously but the proportion of the length and thickness of the body varied and this in proportion to the 'head' parts and the 'shell' that varied widely from massive, fat slugs with minute shells to long thin slugs with enlarged shells. More care and effort is needed in the proportion drawing and there were only a few candidates who constructed a grid to aid this aspect of proportion.

Labels were generally missed or inaccurate. The guide line for the label was often inaccurately placed. The 'eye' was often labelled halfway along the tentacle which was often misnamed as an antenna.

(ii) The measurements for the Fig. 3.1 and the candidates' drawing were recorded accurately on the printed lines provided with appropriate units. These were the figures used in the calculation of the magnification of the drawing. If a larger drawing was made then the magnification usually worked out to be between x 1+ to x 2 if the drawing size was divided by the actual size (8.3 cm) of Fig. 3.1. It is surprising the number of candidates who were unable to calculate this and worked out percentages, additions, subtraction and multiplications of the two measurements. A simple magnification given on the printed line of x ……. was the answer required not a ratio or a length as some candidates wrote.

(iii) Most candidates were able to name one similarity between the slug in Fig. 3.1 and the snail in Fig. 3.2. Candidates should name a feature which is shown present on the two animals and not a negative feature such as 'no legs'.

The features which showed a difference between the slug and the snail were centred on the shell but many candidates failed to state a comparative answer which animal had the larger or spiral shell versus the smaller or simple shell. It is advised that when a difference is required that candidates should make a statement for both animals to show the full contrast. This has been guided in previous Papers by the use of a table.

(iv) Most candidates were able to name the group (phylum) for these two animals but the spelling of mollusc varied widely. It was disappointing to note the range of incorrect answers which seemed to cover every invertebrate and vertebrate group on the syllabus.

Question 4

(a)(i) The test for oxygen, the gas given off by the photosynthesising pondweed, was to rekindle a glowing splint. Although many candidates were able to quote the test correctly, the answers were marred by the fact the splint was often burning at the start. Some candidates incorrectly gave the test for hydrogen or carbon dioxide. A few candidates failed to read the question carefully and answered on the lines of how would you know this gas was oxygen – describing the production of oxygen in photosynthesis.

(ii) Most candidates correctly identified the process. There were a few candidates who answered incorrectly as 'respiration'.

(iii) Many candidates were able to read the meniscus level in the graduated tube correctly as 10 cm^3 and divided this by 5 to calculate the hourly rate. There were a few candidates who quoted 50 cm^3 reading the total volume of the tube in error.

(iv) It appears that many candidates have either carried out or are familiar with this experiment of varying the light intensity on photosynthesis in pondweed. The descriptions were detailed and accurate for changing the distance from the lamp and the use of a heat filter to control rising temperatures. Of the other candidates who did not seem so familiar with this procedure, there were several plausible suggestions involving different wattage bulbs, variable resistors or different filters and the elimination any background light.

Many of the basic principles of experimental planning were credited such as using the same piece of pondweed, an equal period of time for adjustment between moving the tube, use of a standard quantity of hydrogen carbonate in the water, same time period for measurement or time for an equal volume of oxygen to be collected.

(b) Many candidates are now familiar with the use of hydrogen carbonate indicator and the answers for the three parts of **(b)** were very sound. There is still some confusion for some candidates with food tests and the colours given for the three parts were incorrectly based on the starch/iodine test and given as blue – black.

(i) Most candidates realised only the pondweed was present in the tube so photosynthesis in the bright light was in excess of respiration so the carbon dioxide was present in minute quantities and the indicator showed a purple colour. Some candidates incorrectly stated that the oxygen was an alkaline gas and it was the oxygen that changed the indicator to purple.

(ii) Although many candidates suggested the colour of the indicator in Fig. 4.3 would be red, the explanations were sometimes muddled. The indicator is likely to be red because there is a balance between the respiration of the water shrimp and the photosynthesis and respiration of the pondweed so the balance of carbon dioxide uptake and emission is even. It is the idea of compensation point, however that is expressed. It is not the balance between oxygen and carbon dioxide which will cause the colour change of the indicator. Less able candidates referred to the pH status that oxygen was alkaline, carbon dioxide was acidic and so the two balanced and the solution was neutral and so was red.

(iii) This third part was answered correctly by more candidates compared with **(i)** and **(ii)**. The three water shrimps' respiration produced sufficient carbon dioxide which could not be used up by the pondweed in photosynthesis this would make the solution acidic and so the indicator changed to yellow. Some candidates were confused and incorrectly gave a purple colour for the indicator and tried to explain it.