SPORTS, EXERCISE AND HEALTH SCIENCE

Overall grade boundaries

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 17	18 - 33	34 - 46	47 - 56	57 - 66	67 - 76	77 - 100

General comments

This was the fourth May session for the Sports, exercise and health science pilot course (SEHS) and it was a pleasure to moderate teachers who had clearly taken time and effort to act on the feedback provided in the May 2011 subject report. Practical programmes once again were appropriate and in line with the Internal Assessment (IA) criteria. In most centres the criteria were applied rigorously.

Standard level internal assessment

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 8	9 - 16	17 - 22	23 - 27	28 - 33	34 - 38	39 - 48

General comments

Teachers who included the "complete", "partial" and "not at all" breakdown of their marks were providing helpful information to the moderators. This, combined with comments and feedback to the candidates, made it very clear as to how the teachers were awarding marks. Clearly all teachers took a lot of time and trouble to prepare their IA sample. This effort is very much appreciated. It is a lot easier for a moderator to support a teacher's marks when there are clear notes accompanying the sample.

Teachers must enclose all instruction sheets and/or summaries of oral instructions for the investigations in the moderation sample. Most centres complied with this requirement. When Data collection and processing (DCP) is being assessed, the method designed by the candidate or provided by the teacher is required. When Conclusion and evaluation (CE) is being assessed, all the steps in the scientific process are needed for moderation.

It would be helpful if the full IA title (candidate) was included on investigations on the 4/PSOW form as it would be easier for the moderator to match up the candidate work that was to be assessed. It would also be helpful to the moderator if candidate work was bound or stabled together. Forms were generally completed correctly, however, some cover sheets for

candidates were not completed and this made it hard to see which marks/ experiments/ parts of experiments were to be moderated.

It was clearly evident that some teachers linked and worked with other colleagues to ensure internal standardization had taken place. Centres should continue to link and work with the Biology Department to set a common standard and aid with the internal standardization process.

Overall, teachers entered several marks for each criterion from a variety of investigations. This is very encouraging to see. It implies that the candidates are receiving adequate feedback as they proceed through the practical scheme of work. One can even see the learning curves of candidates who pay attention to this feedback.

Some centres sent photocopies of the candidate work. Usually these were of good quality. The problem is that graphs and diagrams using colour can be confusing. It would be better to send the originals and keep back a photocopy.

Note: atypical candidates should be replaced in the sample. These include candidates whose work is incomplete or transfer candidates where a substantial part of their work has been marked by another teacher.

The areas of the programme that proved difficult for the candidates

The research question/focused problem is different to the teacher prompt and should include the dependent (you measure) and the independent (you change) variables. The variables stated in the research question must be those that are directly measured. The dependent and the independent variables were not always clear and it is ideal to have 3-5 repeats for each variable. Candidates must ensure that their investigations have the potential to generate sufficient data for substantial processing. A lack of data meant that individual averages could not always be processed. A minimum of five is also needed to undertake further statistical analysis in the form of standard deviation.

Each data table should include a descriptive title containing both the dependent and independent variables. Every header requires appropriate units along with the error margin. Many candidates were missing quite obvious conventional points such as indicating uncertainties in their data. The number of decimal places must also reflect the precision of the measuring instrument and all decimal places must be consistent in raw and processed data. Raw data was not always recorded as candidates recorded averages only (processed).

Only processed data is to be presented graphically and the x and y-axis must be clearly labelled. When candidates use error bars on graphs, there needs to be an indication of what these values represent. Teachers are also missing these points and a few were marking over generously.

There was evidence that literature sources were being consulted to provide valuable background information in determining the initial research question and in the discussion of the results. Teachers could further challenge their candidates to add value to their own data findings by referring/comparing/contrasting with an existing data or theory reference. Candidates also need to be cautious when relying solely on websites regarding references. The Internet is to be used to complement more quality assured sources. Care is needed in the correct ways to present citations of references.

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Many candidates failed to score full marks on the conclusion and evaluation component and this is an immediate area for attention. To maximize the marks in CE (aspect 1) candidates should include data from their results to back up findings and refer to the appropriate statistical test to discuss the significance of the data. When evaluating procedures (aspect 2) candidates were often commenting on mistakes rather than methodical errors or significant ways to improve the investigation. Candidates could focus on repeats or increasing the data range of the independent variable. Few candidates discussed the significance of the error and only identified relevant weaknesses.

The levels of knowledge, understanding and skill demonstrated

The variety of investigations, and the duration and coverage of the practical programme were generally good. The quantity and type of data was very good in some centres and adequate in the majority.

Rules applied by the moderators

In the event of the teacher providing too much guidance to the candidates or ignoring the criteria the following scale is applied by the moderators:

Criterion	Problem	Teacher awards	Maximum moderator can award
Design	Teacher gives the problem or research question.	c; c; c = 6	p; c; c = 5 Candidates could have identified their own control variables.
Design	It is clear that the candidates have been told precisely what apparatus and materials they require and have not modified it.	c; c; c = 6	c; c; n = 4
Data collection & processing	The candidates have used a photocopied data table with headings and units.	c; c; c = 6	p; c; c; = 5 Candidates could have added uncertainties or relevant qualitative observations.
Data collection & processing	The candidates have been told, on the method sheet, to draw a graph from their raw data and which variables to plot or process the data in a particular way.	c; c; c = 6	c; n; c = 4
Conclusion and evaluation	The candidate has only indicated as a criticism that they ran out of time and their only suggestion as an improvement is that they should repeat the investigation.	c; c; c = 6	c; n; p = 3

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The Criteria

Design (D)

The range and suitability of work varied between centres. Some teachers need to set general themes with plenty of scope for different investigations in order to avoid situations where the whole class is attempting the same investigation. Candidates should not be told which type of equipment to use or which calculations to use when designing their own investigations. Teachers should not be afraid to counsel candidates away from investigations that will lead to trivial results. It is good practice for candidates to follow through their own designs, which most centres seem to be doing. Very thorough background research was evident in some designs, and this helped candidates in their discussion. Centres could also encourage candidates to report briefly on ethical issues in their design and again in their conclusion.

The programme requires that the investigations assessed should contain quantitative data. There were no cases of centres presenting only qualitative data. Associated qualitative data is, however, to be expected and this was not always the case. Candidates' observations during the experiment will assist them in determining the validity of the data and strengthen their conclusion.

The three categories of variables must be clearly identified. Candidates need to be taught what the different variables are and what their relationship is. The range of values of the independent variables was not always sufficient to establish trends. The number of repeats was not always sufficient to permit statistical analysis. The type of statistics being performed was of a good level in most cases.

Standard protocols will, no doubt, be used by the candidates when they design their investigations. However, these standard protocols must be significantly modified or applied to the candidate's own investigation. For example, if fitness is being investigated and the candidate uses the Harvard step test, this is legitimate. If the investigation is simply to determine the fitness of one person then it remains trivial and it repeats many textbook investigations. If the investigation is used to determine the effect of a particular training programme on fitness levels, the investigation becomes more substantial. When candidates design investigations that require different individuals as subjects they should consider the problems of obtaining a representative sample.

Data collection and processing (DCP)

Each data table should include a descriptive title. Every header requires appropriate units along with the error margin. The error margin could be human error as this is often more applicable (e.g. ±0.5 seconds, ± 0.5cm). The number of decimal places must reflect the precision of the measuring instrument.

It may be that class data is required in order for the candidate to gain access to sufficient data for significant data processing and the determination of uncertainties. If class data is to be used and DCP is to be assessed, a number of precautions must be respected. The candidates must present their own data and this can be achieved either by (1) presenting their own data first or (2) clearly identifying which is their own data in a pooled data table. The candidates must plan and produce their own data table. Copying a table from other candidates will be counted as collusion. Teachers who provide the candidates with a pre-formatted data table can expect to have their marks adjusted by the moderator. There were occasions when subjects did not present any raw data, and included only processed data.

When calculations are made it is important that the pathway to the answer is clear. This does not mean there has to be a worked example but a result that springs up out of nowhere will not be credited.

Where the moderators had to reduce the marks of the teachers it was for the following reasons:

- No uncertainties were given in the tables of data collected using measuring instruments

- There were inconsistent decimal places in tables

- The decimal places did not correspond to the precision of measurements

- The processed data (2 decimal places) on occasions had a higher degree of precision than the raw data

- Lack of data meant that individual averages could not always be processed

- There were no associated qualitative data

- Raw data were plotted in graphs that do not actually reveal anything (e.g. maxima, minima, optima or intercepts)

- Raw data were plotted when the mean should have been calculated and plotted

- There was no statistical treatment of the data

- There was no presentation of uncertainties in graphical data either by using trend lines or error bars

- The error bars, when used, were not identified or accompanied by a explanation of what these values mean

- Trend lines were not used to express uncertainties.

- Tables did not have a descriptive title containing both the dependent and independent variables.

Conclusion and evaluation (CE)

As a rule, teachers were encouraging the candidates to collect sufficient data so that conclusions could be drawn from the results. On occasions, the statistical analysis was sufficient to reveal relationships between the variables and their degree of significance. However, in order for candidates to gain the highest possible marks within the CE (Aspect 1) candidates should include data from their results to back up their findings. Excellent reference to the appropriate statistical test to discuss the significance of the data was evident in some centres. Generally, literature values were consulted by the candidates. Anomalies were sometimes identified and excluded and could be developed further through a discussion of the possible origin of these anomalies.

Candidates in some centres show that they have developed a mature sense of criticism of the investigation. Their evaluation of their results is based upon a balanced critical analysis of the data. Candidates who have not developed this skill tend to remain superficial in their

evaluation. The weaknesses they identify are hypothetical without evidence to back it up. For weaker candidates, the experimental weaknesses are restricted to having a limited amount of time or errors in their own manipulation that once again remains hypothetical ("I could have incorrectly measured the temperature").

Candidates should describe at least three major weaknesses and suggest a sensible improvement. The evaluation could also be presented as a table: (1) weakness, (2) significance of weakness and (3) suggested improvement. The inclusion of a separate column for the significance of the error helps draw candidates to the importance of discussing the significance of the error in addition to solely identifying weaknesses. Suggested modifications were superficial from weaker candidates and some teachers were marking over generously. Evaluation is a good discriminator of the high achieving candidates and teachers would do well to remember this when they are marking their candidates' work.

Manipulative skills (MS)

There is evidence that candidates are being exposed to a very good range of investigations. This ensures that the manipulative skills can be assessed correctly.

Ethics and Safety

SEHS will inevitably involve investigations using human subjects. Safety must be paramount to investigations. Using fellow candidates for investigations into the effect of exercise on the heart rate can be considered unsafe if the health status of the candidates is not determined first. The International Baccalaureate (IB) does not wish to inhibit investigations but it does want to stimulate a responsible attitude towards experimentation. If necessary, teachers may need to make adjustments to their Practical Scheme of Work especially where human volunteers are involved. Candidates could also be encouraged to report briefly on any ethical issues, which arise during their investigations e.g. ensure confidentiality of participants. The animal experimentation policy and ethical practice poster can be found on the subject homepage on the Online Curriculum Centre (OCC).

ICT coverage

There was evidence of excellent ICT coverage by some centres.

Centres seem to have made an effort to equip themselves with the necessary materials to carry out data logging. However, the use of this material in investigations for internal assessment of the criteria needs to be carried out with care. Teachers and candidates are strongly advised to read the relevant section of the subject guide.

Graph plotting using software was perhaps the easiest and most widespread for centres to apply. However the signs are that some candidates still need to be taught the correct conventions of graphing. There is a tendency to use bar charts for everything amongst the weakest candidates, perhaps because it is the default setting. Legends (keys) are not always necessary and some candidates do not seem to know how to de-select them. When they are needed the candidates often have difficulty labelling them appropriately – candidates often present the different curves as "series 1" and "series 2". When candidates used a scatter plot, a trend line was not always used when it was appropriate.

The use of spreadsheets for data processing was less apparent in the moderated investigations. When spreadsheet tables are inserted into document files the conventions of

presenting tabulated data still need to be ensured (e.g. Centring numbers, adjusting the number of decimal places, column headings).

The Group 4 Project

This project was used correctly for assessment of Personal Skills (PS) and no other criterion.

The type of assistance and guidance teachers should provide for future candidates

- Read the feedback from this session and act upon it.

- Consult the OCC for Teacher support material (TSM) for the IA component of the course. The TSM shows application of the criteria in the assessment of practical work. It consists of a series of investigations or part investigations by candidates that have been assessed by moderators using the assessment criteria.

- Apply the internal assessment criteria rigorously.

- Ensure that the open-ended theme that you set has enough scope to provide a variety of research questions.

- Give the candidates experience in identifying independent, dependent and controlled variables.

- Encourage the candidates to make additional observations about their experiment (qualitative data).

- Ensure that the investigations have the potential to generate sufficient data for substantial processing.

- Teach the candidates that plotting graphs of raw data is often insufficient.

- Further challenge the candidates to add value to their own data findings by referring comparing and contrasting with reference to existing data or theory.

- Encourage candidates to report briefly on any ethical issues.

- CE Aspect 1 (concluding) should include data to back up findings and reference to the appropriate statistical test to discuss the significance of the data.

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 13	14 - 20	21 - 22	23 - 24	25 - 26	27 - 30

General comments

Each session teachers are invited to submit comments about each exam using G2 forms. These forms can be accessed from the OCC. The comments provide some of the evidence used by the senior examining team during the Grade Award meetings. Not all centres submitted G2 forms, with only five G2 forms submitted. Four stated that the level of difficulty was appropriate and that the paper was of a similar standard in comparison with last year's paper, and one reported that it was more difficult. Two reported that the clarity of wording was satisfactory and three reported that this aspect was good. The presentation of the paper was rated as satisfactory or good by all. The examining team agreed with the G2 comment that there was a fair mix of quantitative and qualitative type responses with a balanced diversity of topics covered.

The following topics/sub topics were done really well: 1.2.5 identify the location of skeletal muscles in various regions of the body; 2.1.2 outline the functions of the conducting airways; 2.2.9 define the terms systolic and diastolic blood pressure; 3.1.1 list the macronutrients and micronutrients; 4.1. label a diagram of a motor unit; 5.1.3 outline the different approaches to classifying motor skills; 5.2.8 define the term response time; 5.3.5 define the concept of transfer.

In general, the following areas were good but could be improved upon:

1.1.8 distinguish between the different types of joint in relation to movement permitted; 2.2.5 outline the relationship between the pulmonary and systemic circulation; 3.1.8 state the chemical composition of a protein molecule; 3.1.11 state the energy content per 100 g of carbohydrate, lipid and protein; 4.3.1 define the term impulse; 4.3.9 state the relationship between angular momentum, moment of inertia and angular velocity.

The following areas evidenced some weaknesses and should/need to be improved upon: 2.2.1 state the composition of blood; 2.2.6 describe the relationship between heart rate, cardiac output and stroke volume at rest and during exercise; 3.1.6 state the composition of a molecule of triaglycerol; 5.2.3 outline the components associated with sensory input; 6.3.1 distinguish between the concepts of health-related fitness and performance related fitness; 6.4.3 outline ways in which exercise intensity can be monitored.

The strengths and weaknesses of candidates in the treatment of individual questions

The candidates were VERY well prepared for the following for the following questions: 3 (1.2.5); 4 (2.1.7); 6 (2.2.9); 15 (3.1.1); 22 (5.1.3); 25 (5.2.8); 26 (5.3.5).

The candidates were NOT well prepared for the following questions: 5 (2.2.1); 8 (2.2.6); 11 (3.1.6); 23 (5.2.3); 28 (6.3.1); 30 (6.4.3).

The discrimination index (that is, the extent to which a question distinguishes between the more able and the less able candidates) varied. There were some questions which did discriminate well and some that did not. Some questions performed in a predictable way and no comments need to be made about them. The comments that follow relate to questions where candidate performance was very good or very poor or questions that aroused comment from teachers on G2 forms.

Question 3

This question was one of the easier questions, with a 0.00 discrimination index.

Question 5

This was the second most difficult question in the paper and was a good discriminating question. 'A' proved to be a good distractor.

Question 7

This was a good, discriminating question.

Question 8

This proved to be a challenging question for many of the candidates.

Question 11

This was a really good, challenging question, with two main distractors ('A' and 'D').

Question 12

This was a really good, challenging question, with a high discrimination index. There were two good distractors ('B' and 'C'), with 'B' as the main distractor.

 Question 13

This was one of the harder question on the paper. Option 'D' was the main distractor.

Question 15

This was the easiest question in the paper with a low discrimination index.

Question 16

This was the easiest question in the paper in the paper which did not discriminate.

Question 17

This was a relatively easy question which did not discriminate well.

Question 19

There were two good distracters, A and B.

Question 21

One of the harder questions on the paper and two good distractors , 'A' and 'B'.

Question 23

The difficulty index of the question indicated that this was a harder question. Option 'B' appears to have been the best distractor.

Question 30

This was the most difficult question on the paper and did not discriminate well.

Standard Level Paper Two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 14	15 - 19	20 - 25	26 - 30	31 - 36	37 - 50

General comments

Five G2 forms were received for paper 2. The level of difficulty was reported as appropriate by all. In comparison with last year's paper all reported that this year's paper was of a similar standard. The clarity of wording and presentation of the paper was rated as either satisfactory or good. Some concern was expressed by once centre that section A, question 1 (data-based question) appeared to warrant background knowledge to answer the question (with the exception of 1b). G2 comments suggested that section B optional questions provided good scope/variety.

The areas of the programme that proved difficult for the candidates

There was a very wide range of marks for this paper. In section A the following areas seem to have appeared difficult for some candidates:

Q1(b) calculate the percentage difference in maximal volume expired [2.1.3]; 1(d) discuss the variability of maximal oxygen consumption with different modes of exercise [2.2.16]; 1(g) describe nervous and chemical control of ventilation during exercise [2.1.5]; 2(c) explain the role of insulin and muscle contraction on glucose uptake during exercise [3.2.7]; 3(b) analyse movements in relation to joint action and muscle contraction [4.2.4]; 4(b) distinguish between the characteristics of short-term sensory store, short-term memory and long-term memory [5.2.5]; 4(d) explain the different types of presentation [5.3.8].

In section B it was pleasing to find that all three questions were attempted, with question 5 being the most popular. The following areas challenged some candidates: Q5(d)(i) state and explain the factors that affect projectile motion at take-off or release [4.3.11]; 5(d)(ii) explain how Newton's three laws of motion apply to sporting activities [4.3.8]; 6(d) evaluate the relative contributions of the three energy systems during different types of exercise [3.3.11]; 7(a) discuss the differences between a skilled and a novice performer [5.1.9]; 7(b) outline the importance of the Physical Activity Readiness Questionnaire (PAR-Q) [6.2.3]; 7(c) and (d) outline and evaluate a variety of fitness tests [6.3.3].

The levels of knowledge, understanding and skill demonstrated

On the whole, the candidates seemed to have a reasonable understanding of what was expected of them in this paper. A few candidates really struggled with this paper whilst some displayed comprehensive knowledge of factual information in the syllabus and a thorough command of concepts and principles. It was anticipated candidates would have a firmer grasp of how to: calculate a percentage difference; explain variability in the value of maximal volume expired with different modes of exercise; explain the function of insulin in glucose uptake during exercise; determine knee joint movements (during kicking a soccer ball) in

relation to joint action and muscle contraction; distinguish between short-term sensory store and short-term memory; discuss differences between a skilled and novice performer; outline the importance of PAR-Q; outline the protocol used in the multistage fitness tests; evaluate methods of body composition testing. However, there were candidates who demonstrated a high level of knowledge and understanding and construct detailed explanations of these topics in their answers.

The strengths and weaknesses of candidates in the treatment of individual questions

Question 1: Question parts (a), (e), & (f) were done well, but (b) & (d) could be improved upon.

1(d) Many candidates succeeded in obtain a marking point but found it challenging to achieve further marking points to suggest why greater volumes of oxygen were expired for cycle ergometry.

1(g) was challenging and demanded an application of concepts. Candidates frequently demonstrated some confusion over which type of walking (with or without poles) resulted in individuals breathing more frequently. Candidates appeared to presume that walking with poles would make it 'easier' and constructed a response around this presumption rather than responding to the data that evidenced the converse response.

Question 3: Factual information about the skeletal system was relatively sound. However, movement analysis (joint and movement type) could be significantly improved upon. For example, in 3(b) candidates appeared to be familiar with analysing the kicking action but frequently were unable to apply knowledge of the appropriate muscular contraction to accompany the movement.

Question 4: Candidates struggled to respond appropriately to the command term (distinguish) for 4(b). Candidates mainly focussed their responses on the capacity and duration aspects when distinguishing between the short and long term memory. Few responded with reference to the relative abilities of each part of memory to retrieve information. However, there were some very good responses to 4(a) and 4(c), with candidates providing excellent sporting examples to demonstrate their knowledge and understanding of 'feedback' and 'psychological refractory period'.

Question 5: There was good evidence that candidates have a firm grasp of the muscular system (Q5(a)(i)) and they were very secure in their knowledge and understanding of neuromuscular function (Q5(c)). However, some responses were weaker when attempting to explain how Newton's laws of motion apply to sports technique (5(d)(ii)). Candidates appeared to access 5(c) well though many made the error of responding with reference to performance related qualities as opposed to the structure and function of the respective fibres.

Question 6: Candidates gave some good responses to 6(a)(i) and 6(b). In 6(b) candidates appeared to have a good ability to ascertain that both systolic and diastolic pressures elevated during static exercise. Many then failed to achieve further marking points by discussing the cause of this. There was a wide range in the quality of answers to 6(d).

Question 7: Many candidates gave good responses to 7(e), but of the few candidates who answered question 7 there were some poor answers to part questions (a), (b), and (c). Candidates were familiar with the PAR-Q and were mostly able to outline the purpose of its use as a pre-activity related assessment tool. Opportunities were missed in many cases to demonstrate knowledge of its composition in addition to the relative benefits of using it as method of determining 'readiness'. In 7(d) candidates appeared to be familiar with BMI as a method of determining body composition and less able to evaluate the use of other methods (skin fold, underwater weighing). In 7(e) some candidates confused Fleishman's abilities with the cognitive/physical skill continuums and therefore distinguished them as such. Candidates appeared less able to distinguish successfully between the two taxonomies or give examples of components that appear in each case.

The type of assistance and guidance teachers should provide for future candidates

- Teachers should consult the OCC frequently for teacher support materials.

- Familiarise candidates with the format and types of questions used in paper 2.

- Teach drafting/planning, particularly for sections of questions set at objective level 3.

- Try to improve knowledge and understanding of: how to calculate a percentage difference; nervous and chemical control during exercise; the role of insulin on glucose uptake during exercise; how to analyse movements in relation to joint action and muscle contraction; how Newton's laws of motion apply to sports techniques; how to outline and evaluate a variety of fitness tests.

- Try to work towards and achieve a greater understanding of the meaning of the command terms used in questions. For example, question 5(d)(i) is 'discuss' – some candidates answered this question as though the command term was 'list'.

- Continue to provide candidates with and even wider range of sporting examples to highlight concepts.

- Teach candidates to answer the question. For example, questions 1(c) and 2(c) are 'during exercise' (not at rest) and question 6(d) is 'for a team game' (not an individual activity).

- Ensure that all candidates follow the 'instructions to candidates'.

Standard level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 6	7 - 13	14 - 16	17 - 20	21 - 24	25 - 28	29 - 40

General comments

There were four G2 forms received for paper 3. All centres stated that the level of difficulty was appropriate. In comparison with last year's paper one thought it was a little easier, two indicated that M11 was of a similar standard, and one recorded that M12 was a little more difficult. The clarity of wording and presentation of paper was rated as satisfactory or good.

The paper generated a range of responses demonstrating very sound knowledge and skills within a significant number of candidates. The responses indicated that appropriate information and teaching had been made available to candidates, though there was concern from the examining team that some candidates were not well prepared. In many cases candidates were able to respond well to Objective 1 and 2 questions, but some could improve in their response to Objective 3 questions. Interpretation of data provided in questions was dealt with confidently by most candidates who were in most cases were able to extract specific data information and relate this to concepts.

The areas of the programme that proved difficult for the candidates

Following the trend of recent years options A, B and D were the favoured options. It is re-assuring that the four options are attempted by candidates, but is disappointing (again) to observe that option C was answered by a single candidate.

There is the impression that most (but not all) candidates were well prepared for this examination. The following areas seem to have been difficult for some candidates: A2 outline how the body thermoregulates in hot and cold environments [A.2.3]; B1(b) describe the theoretical approaches to arousal [B.3.2]; D1(b) explain why endurance athletes require a greater water intake [D.2.7]; D3 describe the absorption of amino acids from the intestinal lumen to the capillary network [D.1.6].

The levels of knowledge, understanding and skill demonstrated

Most of the candidates demonstrated a very good knowledge and understanding of the options. On the whole most candidates have a firm grasp of the expectations for this options paper. The data questions were answered well by the majority of candidates and some candidates evidenced a first class knowledge and understanding throughout their paper.

The strengths and weaknesses of candidates in the treatment of individual questions

Option A

This option was generally answered very well by many of the candidates. It is pleasing that the candidates seem to be comfortable with application of concepts and principles, as evidenced in their examples from sporting/exercise situations.

A1(a) Candidates frequently opted for fartlek and interval training responses rather than continuous.

A1(b) Candidates appeared to understand the term muscular power but few were able describe the requirements for improving muscular power.

A1(c)(i)/(ii) This was well answered throughout.

A1(d) In most cases, candidates were able to compare the symptoms. However, there are many examples of candidates not being able to compare overtraining and over-reaching and appeared to interpret over-reaching as a more severe form of overtraining.

A2 Candidates invested a lot of time outlining how the body made sweat and transported it the skin rather than outlining how the evaporation of the sweat had a cooling effect on the body.

Option B

An added-value aspect of responses to questions within this option was the apparent readiness of candidates to use sporting examples to clarify and strengthen their answers, and this is encouraged. This was evident, for example, in responses to B2(b) where candidates were presenting relevant information about social learning theory in sporting contexts. Some candidates were weaker in some questions because they did not answer the question. For example, B1(b) 'optimal arousal levels' – 'for the same athlete' – 'in different sporting contexts'; candidates should try to ensure that they meet all three criteria when answering this type of question.

B1(c) was well answered throughout although few candidates made specific reference to either Hebb's optimal arousal theory or Kerr's reversal theory.

B2(a) This was well answered throughout.

B2(b) This part question was generally well answered throughout although responses tended to focus on one of the four aspects of demonstrating a skill using social learning theory (attention, retention, motor reproduction, motivation), particular lingering on the motor reproduction stage.

B3 Candidates managed to access the marking points for this question well although did so from applying knowledge of the 100m athlete example, rather than from a context of understanding that the stress process is an imbalance caused from demand of the situation versus the capability of the athlete.

Option D

There were some good objective level 3 answers where candidates displayed a high level of knowledge of factual information combined with a thorough command of concepts. For example, question D4(b) required a detailed explanation of a fairly complex metabolic type question, in an applied context. It was pleasing to note how well a significant number of the candidates have given very good answers and attempted to 'answer the question'. This was in contrast to weaker responses given to D1(b)(water distribution, D2.3) and D3 ('digestion and absorption', D1.6).

D1 (c) Candidates were familiar with urine colour as a method of monitoring hydration status and made limited reference to other available strategies.

D3 Candidates did not appear completely familiar with the absorption of amino acids. Few responses were observed that were consistent with the content of the markscheme.

D4(a) Candidates frequently labelled the converse response to what was required .

D4(b) Candidates were largely able to respond capably to the requirement of explaining carbohydrate loading. The content of the markscheme provides useful guidance to inform practitioners of up-to-date context on the use of the strategy.

The type of assistance and guidance teachers should provide for future candidates

- Consult the OCC frequently for teacher support materials.

- Ensure that all candidates follow the 'instructions to candidates'. For example, ensure candidates answer **two** of four options.

- There were some outstanding papers presented and they were a joy to assess. To build on this try to ensure all candidates have a slightly firmer grasp of some areas: environmental factors and physical performance (how the evaporation of sweat cools an athlete's body during exercise); mental preparation for sport (theoretical approaches to arousal); digestion and absorption (the absorption of amino acids from the intestinal lumen to the capillary network); water and electrolyte balance (why endurance athletes require a greater water intake).

- Continue to encourage candidates to draft key elements of possible answers, to help contribute to clarity of response to questions, for example A1(b), A1(d), A2, B2(b), D1(c), D3.