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SPORTS, EXERCISE AND HEALTH SCIENCE

Overall grade boundaries

Standard level

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 16	17 - 33	34 - 46	47 - 57	58 - 67	68 - 77	78 - 100

General comments

This was the very first session for Sports, exercise and health science pilot course (SEHS) and it was a pleasure to moderate teachers who had clearly taken time and trouble to make sure their practical programmes were appropriate and in line with the Internal Assessment (IA) criteria. In most schools 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

Clerical procedure

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 of SEHS take a lot of time and trouble to prepare their (IA) sample. This effort is very much appreciated. They should be congratulated for their efforts and their candidates will reap the benefits. 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 schools complied with this requirement. Furthermore, 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.

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

Overall teachers entered several marks for each criterion from a variety of investigations. This is very encouraging to see. Where several marks appear 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.

No transcription errors between the marks indicated on the work and the mark on the 4/PSOW form were noted.

Some schools 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.

The areas of the programme that proved difficult for the candidates

Candidates are missing quite obvious conventional points (e.g. indicating uncertainties in their data). 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. Care is needed in the correct ways to present citations of references.

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.

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

The Criteria

Design (D)

The programme requires that the investigations assessed should contain quantitative data. There were no cases of schools presenting only qualitative data. Associated qualitative data is, however, to be expected.

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 were usually sufficient to establish trends and the number of repeats were sufficient to permit statistical analysis. The type of statistics being performed was of a high level in most cases.

Teachers need to set general themes with plenty of scope for different investigations. Teachers need to avoid situations where the whole class is attempting the same investigation. 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 schools seem to be doing.

Standard protocols will, no doubt, be used by the candidates when they design their investigations. We are not expecting them to re-invent the wheel. 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)

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. The moderators understand this. 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 <u>own</u> data or clearly identify 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 and the school's IA work will be subject to an enquiry. Teachers who provide the candidates with a pre-formatted data table can expect their candidates to be moderated down.

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
- 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
- Trend lines were not used to express uncertainties

Complete may not mean perfect but when the mistakes are consistent they will have an impact on the moderated marks.

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. Teachers should discourage the use of non-metric units (e.g. teaspoon or °F). Joules should be used in preference to calories. Conversion programmes exist that are easily available online.

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Conclusion and evaluation (CE)

As a rule the teachers were encouraging the candidates to collect sufficient data so that conclusions could be drawn from the results. This is a good sign and it is to be hoped that it continues. Furthermore, the statistical analysis was sufficient to reveal relationships between the variables and their degree of significance.

Generally literature values were consulted by the candidates.

Candidates in some schools 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 remain hypothetical ("I could have incorrectly measured the temperature"). 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.

Suggested modifications were superficial from weaker candidates but the teachers were in general identifying this and marking appropriately.

Manipulative skills (MS)

There is evidence of the candidates being exposed to a sufficient 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 in school. 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. The safety and ethics of science investigations have been reviewed and a new animal experimentation policy has been posted on the Online Curriculum Centre (OCC).

ICT coverage

This was adequately covered by the majority of the schools.

Schools 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 schools 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 the 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. Evidence of participation in the project does not need to be presented unless it is specifically requested by the IB.

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

- Read the feedback from this session and act upon it

- Consult the Online Curriculum Centre (OCC) for Teacher support material (TSM)

- 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

- 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

- Encourage the candidates to carry out research into the background literature both before starting an investigation and once the results are complete

- **Do not** use the Group 4 Project for assessment of D, DCP CE or MS. Only use it for Personal Skills. Inappropriate use will be sanctioned in subsequent sessions.

- Make sure that you are using the most up-to-date version of the 4/PSOW form (available on the OCC)

- Check to be sure that all the parts of the 4/PSOW form are completed correctly

Standard level paper one

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 13	14 - 19	20 - 21	22 - 24	25 - 26	27 - 29

General comments

Each session teachers are invited to submit comments about each exam. These forms can be downloaded from the OCC. These comments provide some of the evidence used by the senior examining team during the Grade Award meetings, it is hoped that more will be submitted in future sessions. Unfortunately, only two G2 forms were submitted during this first session, both stated that the level of difficulty was appropriate. One reported that the syllabus coverage and the clarity of wording was satisfactory, and the other reported that the syllabus coverage and clarity of wording were good. Both stated that the presentation of the paper was good. The difficulty index (i.e. the proportion of candidates giving the correct answer for each question) supports that there is a good spread of marks across the paper. The discrimination index (i.e. the extent to which a question distinguishes between the more able and the less able candidates) varied from 0.05 to 0.68. There were no questions with a negative discrimination index (i.e. those which the more able candidates tended to get the wrong answer). There appear to be a good number of discriminating questions on this paper, with a smaller number that did not seem to discriminate well.

The following topics/sub topics were done really well: 1.1 The skeletal system; 2.1 Structure and function of the ventilatory system; 2.2 The structure and function of the cardiovascular system; 6.3 Principles of training programme design. In general, the following areas were good but could be improved upon: 3.2 Carbohydrate and fat metabolism; 3.3 Nutrition and energy systems; 4.3 Fundamentals of biomechanics; 5.2 Information processing; 5.3 Principles of skill learning; 6.1 Statistical analysis. The following areas evidenced some weaknesses and could be improved upon: 4 Movement analysis (sliding filament theory); 5.2 Information processing (feedback); 6.2 Components of fitness (outline and evaluate a variety of fitness tests).

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

The candidates were well prepared for the following for the following questions: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 16 and 29. The candidates were NOT well prepared for the following questions: 17 (sliding filament theory), 18, 22 (5.2.14 Outline the role of feedback in information processing models), 23 (5.2.5 Distinguish the characteristics of *short-term sensory store*, *short-term memory*, and *long-term memory*) and 28 (6.2.7 Outline and evaluate a variety of fitness tests).

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Question 18

This question was deleted because the stem of the question was about calculation, but two of the potential answers did not involve any calculation. This decision was supported by the low difficulty index and a not so great discriminatory index for this question. Answers 'C' and 'D' for **question 23** because it was considered that both answers could be correct.

Question 4

This was the easiest question on the paper and 98% of the candidates were able to identify the correct pathway taken by an oxygen molecule. However this question did not discriminate well (discrimination index 0.05).

Question 19

This question had a discrimination index of 0.36 within the 'ideal range', with almost 54% identifying that option B was the correct answer. However, almost one in three candidates (32%) were distracted by option C.

Question 21

This question had the second highest discrimination index (0.64), Almost 69% of the candidates identified how *ability* is best described.

Question 27

This question had the highest discrimination index (0.68) and 58% of the candidates were able to answer it correctly (option C). However, 26% selected option B which suggested the handgrip dynamometer test required the athlete to perform an isometric contraction i.e. option B was a good distractor.

Question 30

The *negative* wording in the question could partly explain why almost 34% of candidates gave the wrong answer.

Standard level paper two

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 7	8 - 14	15 - 20	21 - 26	27 - 31	32 - 37	38 - 50

General comments

Only two G2 forms were received for paper 2, and this means that one should be cautious about drawing any firm conclusions. One teacher thought the level of difficulty was appropriate whereas the other considered it was too difficult. For the syllabus coverage and clarity of wording one teacher indicated poor suitability and the other reported satisfactory suitability. Both teachers confirmed that the presentation of the paper was good.

The areas of the programme that proved difficult for the candidates

Some candidates lost marks because they did not read the questions carefully. It is important for candidates to know and understand that examination questions are always written using the 'command terms', the meaning of which is precisely set out in the subject guide. For example, some candidates failed to notice that when they were asked to 'evaluate', and if they simply 'described', they could not gain all the marks for that question (Question 8d).

It was anticipated that the candidates would have a solid foundation of knowledge and understanding of Topic 3 `Energy Systems`, but this was not evident in many of the candidates (refer to questions 4c and 7c)..

In section A the following areas seem to have proved difficult for candidates: statistical analysis (6.1.4); carbohydrate and fat metabolism [3.2.4]; the characteristics and classification of skill (5.1.10); nutrition and energy systems [3.3.7, 3.3.8 & 3.3.9]. In section B most candidates answered question 6, with very few opting for questions 7 or 8. Many candidates struggled with question 6(e), structure and function of the cardiovascular systems [2.2.7, 2.2.13 & 2.2.15]. Those who answered question 7 found part (c) quite difficult, nutrition and energy systems [3.3.11], and there was a lack of clarity with answers to question 7(d), fundamentals of biomechanics [4.3.12]. Question 8 (d) was not done well, components of fitness testing [6.2.7], with candidates tending to be descriptive rather than evaluative. However, it must be stressed the some candidates had no difficulty with each of the above areas.

The levels of knowledge, understanding and skill demonstrated

In general, there appears to be a spread of marks across both sections A and B, and overall the majority of candidates seemed to have an understanding of what was expected of them in this paper. Objective 1 or Objective 2 questions evidenced sound knowledge of the areas. However, Objective 3 questions, i.e. the more conceptual aspects, clearly differentiated the understanding of candidates.

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

Question 1

Parts (a), (b) and (c) were done well, but parts (d), (e) and (f) could be improved.

Question 4 c

It seemed that candidates possibly lacked an understanding of the demands of 800 m running i.e. a lack of practical experience of the demands of the event may have handicapped some candidates.

Question 5 b

It appeared that some candidates struggled with this question.

Question 6

Parts (a), (b), (c) and (d) were generally done really well by the candidates.

Question 8 d

Many struggled with the <u>evaluative</u> aspect of this question. This might possibly be due to **c**andidates being more familiar at the descriptive level regarding fitness tests.

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

- Teachers should consult the online curriculum centre (OCC) frequently for teacher support materials

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

- Try to improve the candidates knowledge and understanding of:

    - statistical analysis;

    - the evaluative aspect of fitness tests;

    - carbohydrate and fat metabolism;

    - cardiovascular-respiratory mechanisms that explain adaptations with training.

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

Standard level paper three

Component grade boundaries

Grade:	1	2	3	4	5	6	7
Mark range:	0 - 5	6 - 11	12 - 16	17 - 20	21 - 24	25 - 28	29 - 40

General comments

Only two G2 forms were received for paper 3,. Both teachers thought the level of difficulty was appropriate. It is re-assuring to note that both teachers indicated good suitability of the question paper for the syllabus coverage, clarity of wording and presentation of the paper. However, it appears that teachers are avoiding Option C (Physical activity and health) With current lifestyle trends it is a very important area to be covered within SEHS. Most candidates attempted Option A (Optimizing physiological performance) with either option B (Psychology of sport) or Option D (Nutrition for sport, exercise and health).

The paper generated a range of responses demonstrating sound knowledge and skills within many candidates. The responses indicated that appropriate information and teaching had been made available to candidates and few questions generated poor responses from all candidates sitting the exam or within one centre. In the majority of cases candidates were able to respond well to Objective 1 and 2 questions but not so well on Objective 3 questions. Interpretation of data provided in questions was well dealt with by candidates who were in most cases able to extract specific information as well as identifying trends and outlining concepts.

The areas of the programme that proved difficult for the candidates

The following areas seem to have been difficult for some candidates:

- Option A, training [A.1.4]

- Option B. individual differences [B.1.3 & B1.6], motivation [B.2.6] and mental preparation for sport [B.3.4]

- Option D, nutritional strategies (D.4.4, D.4.5, D.4.6 and D.4.9).

The levels of knowledge, understanding and skill demonstrated

In general the candidates demonstrated a sound knowledge and understanding of the options. For most candidates data interpretation was sound. There is a spread of total marks for this paper and, on the whole, candidates have a grasp of the expectations for Paper 3. In particular, a sound understanding was evident of:

- environmental factors and physical performance (option A);

- intrinsic and extrinsic motivation (option B);

- psychological skills training (option B);

- water and electrolyte balance (option D).

The answers given by candidates to objective level 3 questions ranged from comprehensive answers that remained focused on the questions and provided authoritative responses to the questions; satisfactory answers, generally accurate, but presented rather descriptively; answers that contained inaccuracies, omissions and/or misunderstandings

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

Option A, Option B and Option D were by far the most popular options.

Option A

Question 1

- a) The presentation of the graph led to some confusion for some candidates i.e. they interpreted the danger zone as beginning with the line immediately below the words `danger zone` on the graph.

- c) Some candidates were too descriptive and not explaining `why`.

Option B

Question 1

- a) Some candidates struggled with this question, possibly because the knowledge base/research in this area is inconclusive.

- b) Candidates were generally strong when discussing problems but weaker with suggesting potential solutions.

Question 2

b) Some responses to this question indicate that some candidates are struggling with the concept of attribution theory.

Option C

Only one candidate answered option C.

Option D

Question 1

b) and c) Some candidates demonstrated a firm grasp of why humans cannot live without water for a prolonged period of time, and provided sharply-focused answers to describing how the hydration status of athletes can be monitored. However, some answers were too unscientific to gain marks.

Question 3

The coherence of answers to this question regarding the interaction of carbohydrate loading and training programme modification, could be improved upon.

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

- Ensure that candidates are familiar with the definitions of the command terms suggest, discuss, explain, outline, describe, distinguish

- Try to ensure candidates can explain `why` rather than just describe (Objective 33 questions)

- Encourage candidates to draft key elements of possible answers, to help contribute to clarity of response, especially for Objective 3 questions.

- Emphasise to candidates the importance of remaining focused on answering the specifics of the question

- Consult the online curriculum centre (OCC) frequently for teacher support materials