2009 Physical Education GA 3: Examination

GENERAL COMMENTS

The 2009 Physical Education examination was completed well by the majority of students. The examination allowed students to demonstrate their knowledge and most students were able to achieve some marks for most questions. However, it was evident that some students had not completed practical activities as part of their Physical Education studies. Students are reminded to write legibly so assessors can read their responses as it is difficult to award marks to an illegible response.

In Section B, students were awarded full marks for:

- using correct terminology. This is an examination criterion and students who failed to use the correct terminology when answering questions were unable to receive full marks
- referring to the data and providing an example from the data when stipulated in the question. Students needed to analyse the data provided and give a suitable example to support their response
- answering the question by doing what was required. For example, when students were asked to 'contrast', they needed to discuss differences, and when asked to 'compare', they needed to discuss similarities between the two examples provided. Students needed to compare and contrast accurately and concisely
- providing specific examples when required by the question. Students needed to provide specific examples that related to the information presented in the stem of the question
- providing an answer other than the example given in the stem of the question. Students needed to read the question carefully, recognise that one answer had been provided and produce an alternative.

SPECIFIC INFORMATION

Section A – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	2	7	3	87	
2	6	4	41	49	Students assumed that the lactate inflection point (LIP) was more relevant to an event that utilises the lactic acid energy system, rather than the ability to delay relying on anaerobic glycolysis, as is required for a 5000-metre event (option D). Athletes with a higher LIP are able to sustain a faster speed for longer amounts of time.
3	5	1	90	4	
4	2	61	21	16	
5	65	13	17	6	
6	79	14	5	2	
7	48	16	19	16	Many students thought that the poster was an example of a community-based, mass-media strategy rather than an environmental strategy (option C). An environmental strategy is a change to the physical environment that encourages physical activity.
8	50	19	8	22	

Question	% A	% B	% C	% D	Comments
9	20	9	8	63	This question asked students to identify which statement was false and this may have caused them some difficulty. Many students chose option D, indicating that students expected a trained athlete to have less lactate at the end of a 400-metre race compared to a non-athlete. However, a trained athlete would run a 400-metre race at a much higher intensity and therefore have higher lactate levels.
10	45	21	29	4	Students found it difficult to identify areas of oxygen deficit and excess post-exercise oxygen consumption (EPOC) on the graph. Nearly all students could identify that the oxygen deficit occurred at the beginning of exercise and were able to eliminate option D as the correct response. However, many students were unable to determine if the deficit and EPOC were above or below the graph.
11	15	84	1	0	
12	14	11	56	19	
13	3	18	71	8	
14	92	3	2	2	
15	14	16	53	16	

Students handled the multiple-choice section of the paper well. As in previous years, there were a number of students who did not attempt all questions. Students are reminded that they will not be penalised for an incorrect response and should choose the answer that is their ‘best guess’ if they are unsure.

Section B – Short answer questions

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded marks.

Question 1a–b.

Marks	0	1	2	3	Average
%	6	13	34	47	2.2

1a.
Environmental strategy

1b.
Suitable responses included:

- the information boards provide information on how to use the fitness trail and perform the exercises correctly, which leads to an increased awareness of the use of the facility
- working drinking fountains allow people using the recreational space to stay hydrated and eliminates the need to carry drink bottles while exercising
- shade sails allow children to play for longer amounts of or at more times as they are protected from the sun
- increased lighting allows people to have access to walking tracks and bike paths at night and in the early morning, allowing people greater access to the facility and improving the safety of the people using the paths.

Suitable answers addressed removing impediments to activity, increasing access to facilities and providing more opportunities for people to be active. Students were able to answer this question confidently and use the specific examples provided to explain how physical activity levels in a community can be increased.

Question 2

This question was well done by many students. Most students could identify the aerobic energy system in Question 2a. and list VO_2 max. for one mark in Question 2b., even if they were unable to state two physiological variables. In Question 2c, students were required to include the basic elements for aerobic training in their answer; however, many students listed aspects of the National Physical Activity Guidelines (NPAG), such as recommending running for 60 minutes or more at a moderate intensity on most (if not all) days. Students whose answers reflected the NPAG were not awarded full marks.

Question 2a–b.

Marks	0	1	2	3	Average
%	5	34	37	24	1.8

2a.
Aerobic energy system

2b.

- VO_2 max./oxygen uptake
- lactate inflection point or lactate levels
- running economy

Question 2c.

Marks	0	1	2	3	Average
%	10	17	31	43	2.1

- two or more days a week (not more than five)
- 20 minutes or more (but not more than 60 minutes)
- 60–85 per cent heart rate max, moderate or sub-maximal

Question 3a.

Marks	0	1	2	3	Average
%	14	32	34	20	1.6

Three of:

- provide motivation
- provide the players with feedback
- evaluate the training program
- establish a baseline or benchmark
- design a training program
- allows for comparison of players/identify appropriate playing positions.

It was a common mistake for students to identify reasons for conducting an activity analysis instead of fitness testing. Many students also listed strengths and weaknesses.

Question 3b.

Marks	0	1	2	3	Average
%	7	10	19	64	2.4

Steph C because she had:

- the lowest result in the beep test (high aerobic capacity is not needed for the goalie position)
- the lowest phosphate recovery test (a poor result in the phosphate recovery test because the energy systems used in this test are not specific to the goalie position)
- excellent agility, power or speed over a short distance, which are all specific to the position
- greater muscular endurance of the upper body (repeated efforts are required as goalies need upper body endurance).

This question was well handled by the majority of students. They were able to successfully identify the player most suited to being the goalie and provide data to support their choice.

Question 3ci–ii.

Marks	0	1	2	3	Average
%	34	15	24	26	1.4

3ci.
Either of:
- local muscular endurance (upper body) as the results are the lowest with all players rating either fair or good
- anaerobic capacity/power – three out of five players only have a good rating and in soccer the ability to recover quickly is essential.

3cii.
Either of:
- circuit or resistance training that includes exercises that improve local muscular endurance (LME)
- short interval training that involves short sprints with adequate recovery to improve anaerobic power.

This question was poorly done by many students, indicating that they had not participated in a variety of fitness tests or training methods. While many students could identify push ups as the area that required the greatest improvement, few were able to state the fitness component that this test measured and identify the most appropriate training method. Many responses incorrectly included strength as the fitness component and Plyometrics as a method for improving the poor results obtained in the 60-second push up test.

Question 3d.

Marks	0	1	2	Average
%	37	15	48	**1.1**

Either of:
- the beep test and the phosphate recovery test. Both tests cause by-products to accumulate in the body and, with insufficient recovery, these by-products would affect the results of other tests
- you would not run two exhaustive/maximal tests on the same day.

Responses to this question indicated that students had not performed fitness tests during the year. Students who had completed the beep test and the phosphate recovery test would be able to state from experience that these two tests should not be conducted on the same day.

Question 3e.

Marks	0	1	2	Average
%	26	38	36	**1.1**

RESPIRATORY	CARDIAC
• increase in pulmonary diffusion • increased surface area of alveoli • increased elasticity of the lungs • increase in lung volumes (tidal volume and lung capacity) • increased efficiency of the intercostal muscles	• increased capillary network at the heart muscle • cardiac hypertrophy or increased size of left ventricle or increased blood volume • increased stroke volume/cardiac output

Students were much better this year at distinguishing between a respiratory and a cardiac adaptation.

Question 4

Marks	0	1	2	3	4	Average
%	18	11	36	17	18	**2.1**

Pole vault	200-metre sprint
• predominantly uses the ATP-CP system • very high intensity work for less than 10 seconds • predominantly uses the chemical fuel creatine phosphate (CP) • depends on simple and short chemical reactions • no fatiguing by-products • limited by the amount of creatine phosphate stored in muscles	• predominantly uses the lactic acid system • very high intensity work for almost 20 seconds • uses the chemical fuel creatine phosphate (CP) and a food fuel – carbohydrates • involves more complex chemical reactions • produces lactic acid • lactic acid system provides twice the energy of ATP-CP system

Students had difficulty with this question. Many students were able to receive two out of four marks for stating the dominant energy system for each event; however, they were not able to make any further contrast between the energy system requirements of the two events.

Question 5a–b.

Marks	0	1	2	Average
%	20	45	35	**1.2**

Questions 5a. and 5b. were well handled by most students. They were able to identify the lactate inflection point (LIP) and understood clearly why lactate accumulates at running intensities beyond the LIP.

5a.
15 km/hr

5b.
Either of:

- at a specific exercise intensity, lactate production exceeds lactate clearance
- because there is not enough oxygen present to break down the lactic acid so it accumulates.

Question 5c.

Marks	0	1	2	3	Average
%	43	24	21	12	**1**

The lactate inflection point (LIP) determines the speed an athlete is able to sustain before lactic acid accumulation indicates fatigue. The advantage to endurance athletes is that with a higher LIP they can sustain a faster speed for longer amounts of time.

Some students struggled to understand that, for an endurance athlete, a higher LIP means that they can work harder for longer amounts of time before fatigue occurs.

Question 6a.

Marks	0	1	2	Average
%	23	18	59	**1.4**

6a.
Either of:

- Fartlek training – difference in time splits from high to low intensity shown in the graph for the second lap
- long interval training – periods of high intensity followed by an active recovery, shown by the time taken to run/walk each 250 m.

Question 6b.

Marks	0	1	2	Average
%	30	29	40	**1.1**

Fartlek training/long interval training – the game of hockey involves players constantly changing from high intensities to low intensities. Players use their anaerobic systems for sprinting and quick movement and their aerobic systems during periods of recovery, when the game is stationary or when a particular player is not in play.

Question 6c.

Marks	0	1	2	Average
%	21	28	51	1

Two of:
- use a training partner/enlist social support
- use a log book or training log to monitor progress
- use reward systems for completing training
- goal setting (clear, measurable, achievable)
- reminder systems such as post it notes
- vary training to maintain interest.

Overall, Question 6 was answered well by most students. Many could use the data to justify the selection of Fartlek training in Question 6a. and make the link to hockey in Question 6b. Students who did not receive full marks generally were not able to link the information to the energy systems used in a game of hockey. In Question 6c., good answers linked the strategy to increasing motivation, removing the barriers imposed by the fact that it was winter, and that the subject was working longer hours.

Question 7a.

Marks	0	1	2	3	4	Average
%	3	9	30	19	39	2.8

Balance, agility, flexibility, muscular power or strength

Students needed to give an explanation that was specific to the manoeuvre shown. For example, muscular power is required to move the board forcefully and rapidly against the force of the wave. Flexibility is required to allow a greater range of motion of the joints to enable the body to freely move into the position shown in the photograph.

In Question 7a., students were able to identify the fitness components required but found it difficult to link a definition of the fitness component to the movement depicted in the photograph. Full marks were awarded to students who were able to link the fitness component to the movement depicted in the photo.

Question 7b.

Marks	0	1	2	3	4	5	6	Average
%	6	5	14	27	27	17	5	3.3

Students should have considered the following points in their response:
- all energy systems are used to varying degrees in virtually every physical activity, including surfing (interplay)
- references to intensity and duration and type of activity; for example, sprinting at the start of the contest – ATP-PC; paddling out, high intensity – lactic acid; sitting on the board – aerobic and replenishment; after 1–2 minutes into the heat, aerobic will start to dominate, regardless of intensity therefore second and third wave would see an increase in the contribution of the ATP-CP and lactic acid, depending on recovery, but aerobic would still dominate
- links to specific skills and examples provided in the stem of the question.

For example, at the start of the heat, all systems would be contributing to the energy requirements of the surfer. For the first five seconds of the sprint to the water, the surfer would predominantly be using the breakdown of ATP and CP to fuel the activity because it is a high intensity, short duration activity. After this, the anaerobic glycolysis system would start to dominate if the activity continued to be high intensity, for example, sprinting to the water carrying a board, running in the water and then lying on the board to paddle out and catch a wave.

After 10–20 seconds, any high-intensity activity would be powered predominantly by the lactic acid system. As the heat continued, explosive energy for rapid movements would require the incomplete breakdown of glucose because there may not be enough time to recharge the ATP-CP system.

The duration of the heat (20 minutes) indicates an important reliance on aerobic energy for muscular contraction. The surfer is required to paddle out, catch a wave and perform rapid movements on the board. When finished riding the wave, he/she has to paddle back again so movement is fairly continuous. While waiting for a good wave, the surfer uses the aerobic energy system to partially recover (replenishment of CP) from the high-intensity bouts of physical activity.

As the heat progresses and stops being an all-out maximal effort, the importance of the anaerobic systems diminishes and aerobic energy supply increases.

It was pleasing to see students respond so well to Question 7b. The question required an extended response and gave students the opportunity to demonstrate their knowledge of energy systems and interplay. Students who provided information about each of the three systems, when and why they would be used, and linked this back to the scenario given in the stem of the question, received full marks.

Question 8

Marks	0	1	2	3	4	5	Average
%	8	9	28	17	27	4	2.9

Possible answers included:

- adequate supervision – teach students the importance of following the procedures set out by the teacher. The teacher should stand where they can see the whole gym
- sound planning – keep records of practice and documented plans of action for supervising activities and emergency situations. Take into account the age, skill level, maturity, gender, experience and size of the students
- a safe environment – check equipment, for example, bars, beam, Roman rings, gymnastic mats, landing mats, uneven bars, etc. Teach 'spotting' practices regularly, predict dangerous situations and remove dangerous items from the gym
- teachers should keep up-to-date with current practices in coaching gymnastics, including which tumbling activities are deemed appropriate/inappropriate (in terms of risk) by the Education Department
- appropriate first aid – teachers need to ensure that their first aid training is current and first aid equipment is readily available
- adequate warm up – teachers need to ensure that students are warmed up appropriately for the task, for example, stretching to facilitate the flexibility demands of gymnastics on the beam or floor (tumbling, splits, etc.)
- development of strength (core) – develop students' core strength prior to expecting them to perform the skills required in gymnastics, for example, balancing on the beam and power work completed on the floor.

Students had great difficulty identifying three different areas where risk management practices needed to be considered. Many discussed safe environments in three different areas, for example, equipment, clothing and surfaces, and could not receive full marks. Responses to this question indicated that students had a superficial understanding of this key concept.

Question 9

Questions 9a. and 9b. were completed well by many students. Question 9b. asked students to compare the two methods but guided them towards what was required by asking students to discuss advantages and disadvantages of each method. This allowed students to make the comparison. Common errors included comparing the wrong two methods (where no marks were awarded) and discussing how data was collected using each method. Question 9c. was poorly completed with many students still having difficulty understanding the concept of reactivity in the measurement of physical activity levels.

Question 9a–b.

Marks	0	1	2	3	4	5	Average
%	11	6	9	15	20	38	3.4

9a.

Accelerometry

9b.

Self-report log

- good for small groups
- easy to complete
- can provide detailed information
- heavy subject burden
- unreliable, data is less accurate

- limited by recall and memory limitations in children and elderly adults

Accelerometry
- provides information on intensity, frequency and duration
- non-invasive, small and lightweight
- low subject burden
- minute by minute data
- simple, quick data collection
- high cost so not suitable for large groups
- does not provide type or contextual information

Question 9c.

Marks	0	1	2	3	4	Average
%	18	12	38	15	16	**2**

Pedometers – reduce reactivity by putting a cover on them (sealed)
Direct observation – reduce reactivity by repeated visits or by observing participants while they are unaware
HE telemetry – seal or cover data output, repeated measures, discard outliers
Accelerometer – repeated measure, conceal data, discard outliers

Question 10
Responses to Question 10 demonstrated that students had difficulty reading and interpreting the data provided. It is imperative that students can use data presented in tables and graphs. Question 10a. required students to read and use the information directly from the table and many had trouble doing this. Question 10b. was also poorly done and many students listed strategies for reducing excess post-exercise oxygen consumption (EPOC) rather than oxygen deficit.

Question 10ai–iv.

Marks	0	1	2	3	4	Average
%	18	28	27	17	10	**1.8**

10ai.
Exercise 1–3 min

10aii.
2 L/min

10aiii.
2 min

10aiv.
Recovery 1–4 min

Question 10b.

Marks	0	1	2	Average
%	69	10	21	**0.5**

Warm up – increase blood vessel diameter/temperature and supply and use of oxygen
Aerobic training – increase the capacity of the cardiovascular system to increase the amount, rate of supply and/or metabolic use of oxygen

Question 11a–c.

Marks	0	1	2	3	4	Average
%	11	26	24	25	14	**2.1**

Questions 11a. and 11b. were reasonably well handled by students. Responses to Question 11c. reflected students' inability to apply their understanding of a key concept. Many were able to list a physiological reason but were unable to explain how it related to the results depicted in the graph.

11a.
Line A

11b.
120 minutes

11c.
Two of:
- increase in fat metabolising and fat mobilising enzymes
- improved fatty acid oxidation
- reduced total CHO use
- increased ability for glycogen sparing.

Question 12a–c.

Marks	0	1	2	3	4	Average
%	5	10	23	22	39	2.8

Overall, Question 12 was completed well by a majority of students. Common errors included students thinking that energy supply is the lowest at five seconds because the ATP-CP system has a low yield of ATP compared to the aerobic system. Students needed to interpret the information presented in the graph to answer the questions, and not respond with prepared answers on ATP rate and yield.

12a.
2

12b.
60 seconds (after 30 seconds)

12c.
60 seconds. There is no contribution from the anaerobic systems at this time; the only system contributing energy is the aerobic system.

Question 13
In Question 13a., students were again unable to link their knowledge of fitness components to a given practical example. While many were able to identify the fitness components required, few were able to outline why they were important to the given scenario. Students successfully completed Question 13b. Question 13c. was very poorly done and many students were unable to answer correctly. It appeared that students were unclear as to what the question was looking for. Students also struggled with Question 13cii. where they could not describe how a high aerobic capacity could lead to improved performance in cycling. It is important that students have the ability to recall information but they must also be able to apply their knowledge to demonstrate a high level of understanding of the key concepts assessed. In Question 13d., some students used the opportunity to draw a diagram of the test; however, many missed the point that the question asked for the most specific test and the test therefore needed to be completed on a bike. Question 13e. required students to apply knowledge rather than recite information. Many gave a definition of mitochondria but failed to link an increased number to an increase in aerobic respiration. Students are encouraged to develop their understanding of how a chronic adaptation affects performance. A number of students did not answer Question 13fi. Students are reminded that it is important to read the paper carefully and ensure all question parts are completed. Many students were unclear as to the definition of a-VO_2.

Question 13a.

Marks	0	1	2	3	4	Average
%	10	19	28	20	23	2.3

Possible responses could include cardiovascular endurance. Increased efficiency of heart and lungs to provide oxygen to the working muscles for the extended duration of the race

Local muscular endurance (LME) (of the legs in particular)

Repetitive nature of the cycling action, in the face of fatigue, over the length of the race

Question 13b.

Marks	0	1	2	3	Average
%	10	15	28	47	2.1

Lead up
- increase stores (liver and muscle glycogen stores) of CHO (carbohydrate loading)

Cycling each day
- CHOs used as a fuel for muscular contraction
- replenishment of fuels (CHOs)
- usually in the form of sports drinks, sports bars and CHO gels, especially later in the day of cycling

Recovery
- replenishment of glycogen stores (high carbohydrate [high GI]) intake)

Question 13ci–ii.

Marks	0	1	2	3	Average
%	46	35	16	2	0.8

13ci.
He can use 85 ml of oxygen per kilogram of body weight per minute.

13cii.
A high VO_2max. would assist Cadel by enabling his heart and lung systems to supply more oxygen to his working muscles more efficiently. His muscles also have an increased ability to use oxygen, which in turn will result in an increase in the production of aerobic energy.

Question 13d.

Marks	0	1	2	Average
%	58	26	16	0.6

VO_2 max. test on a bicycle ergometer. Expelled air is collected, analysed and measured to determine how much oxygen has been used.

Question 13ei–ii.

Marks	0	1	2	3	Average
%	48	20	18	15	1

13ei.
An increased capacity for aerobic metabolism from oxidation of fatty acids and CHO for endurance level work

13eii.
- increased myoglobin
- improved oxidative capacity via increased oxidative enzymes
- increased capillary density
- increased use of fat during sub-maximal exercise
- increased stores and use of intramuscular triglycerides
- increased muscle glycogen synthase (glycolytic enzyme) and storage
- increased slow twitch fibre size

Question 13fi–ii.

Marks	0	1	2	Average
%	42	37	21	0.8

13fi.
The line needed to be above the line on the graph.

13fii.
Either of:
- how much oxygen the working muscles are using
- a measure of the amount of oxygen in the arteries compared to the veins.

Question 14
Most students were able to identify the stage of motivational readiness that the subject was in and could give examples of behavioural strategies. However, Question 14c. was very poorly done. Many students could not identify the correct training principles or extract data from the table to support their answer. Many students listed 'warm up' as a training principle. It appeared that students who had designed and participated in training programs were more likely to gain full marks for this question than students who had not. Question 14d. was completed marginally better than Question 14c. but students often failed to state if the overload was correctly or incorrectly applied. In Question 14e., students confused training logs with methods for measuring physical activity levels such as diaries and self-report logs and provided the advantages of these methods. In Question 14f., students were generally able to link an increase in self-efficacy to improved success in physical activity or movement through the stages of motivational readiness.

Question 14a.

Marks	0	1	Average
%	29	71	0.7

Preparation stage

Question 14b.

Marks	0	1	2	3	Average
%	27	23	24	26	1.5

Students should have **outlined** three **behavioural** strategies such as:
- enlist social support from a friend, partner or family member
- use of reminder systems, such as putting a sign on her fridge or mirror
- rewards for being regularly active
- make plans or commitments to be active – she could write down which days she will be active
- substitute alternative activities when she is feeling tired/stressed/bored.

Question 14c.

Marks	0	1	2	Average
%	53	31	16	0.7

Frequency – there are three workouts per week
Duration – each session goes for a minimum of 20 minutes
Specific to the intended activity (walking and running) and energy system (aerobic)

Question 14d.

Marks	0	1	2	Average
%	52	16	31	0.8

No, it has not been applied correctly. The increase from week three to week four is too great (more than 10 per cent) in both distance and time in the jogging intervals.

Question 14e.

Marks	0	1	2	Average
%	18	45	37	1.2

Two of:
- record psychological and physiological data
- to monitor performance
- responses to training
- minimise the chance of overtraining.

Question 14f.

Marks	0	1	2	Average
%	14	33	53	1.4

Any of:

- by completing the 5 km run, Kellie increases her self-efficacy. An increase in self-efficacy increases Kellie's belief in her ability to complete the 5 km run and she is more likely to continue to exercise
- success increases self-efficacy and high self-efficacy leads to a greater belief that you can succeed
- increases in self-efficacy are also linked to movement through the stages of change.