VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2008 Physical Education GA 3: Written examination

GENERAL COMMENTS

The 2008 Physical Education examination was completed well by the majority of students. Students performed exceptionally well on the multiple-choice questions. This may be due to students having had more opportunity to practice this type of question and gain experience in reading and analysing the information to select the correct response.

In Section B, high-scoring students:

- used the correct terminology in their response. Use of correct terminology is an examination criterion and students who failed to use correct terminology when answering questions were unable to receive full marks
- read the stem of the question and then related the answer back to the information provided. Students who read and interpreted the question correctly performed well
- referred to the data and provided an example from the data when the question required one. Students who were able to analyse the data provided and give a suitable example to support their response were awarded full marks
- provided sufficient information when an 'outline' was asked for in the question. In the past students have been too brief in their answers when an outline was required. This year students provided more detail than a single word or statement, which is what is expected when asked for an outline
- provided an answer other than the example given in the stem of the question. Students who carefully read the question, recognised that an answer had been provided and were then able to come up with an alternative answer, received full marks.

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	15	18	9	58	
2	68	5	23	4	
3	4	86	7	3	
4	31	35	5	29	Students were unable to recognise that lipids could produce the most ATP and appeared to confuse the amount of ATP produced with the rate of ATP production. The use of the term 'lipids' as an alternative to fats may have also caused some confusion.
5	8	2	84	6	
6	7	65	4	24	
7	1	2	12	85	
8	41	51	1	7	Students overwhelmingly thought that the National Physical Activity Guidelines are designed to increase physical activity levels, however, the purpose of increasing physical activity levels is to achieve health benefits for the population so the correct answer was A.
9	66	3	11	19	
10	3	23	61	13	
11	6	8	77	9	
12	12	3	18	68	
13	62	15	6	18	

14	10	36	20	33	It was apparent that students found this question difficult and many were unable to eliminate the option lactate concentration (option D) even though the stem of the question stated that lactic acid accumulation is unlikely to inhibit muscle contraction force. Students may have had difficulty distinguishing between the different metabolic by-products, however, should have been able to eliminate hydrogen ions as the answer was given as a decrease of hydrogen ions. The correct answer (option B) was an increase in phosphate ion concentration.
15	8	18	63	12	

Students handled the multiple-choice section of the paper exceptionally well this year. However, once again there were a number of students who did not attempt all of the questions. Students are reminded that they are not penalised for an incorrect response and should have an educated guess if they are unsure of the answer.

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 1ai-ii.

Marks	**0**	**1**	**2**	**3**	**Average**
%	15	17	47	22	**1.8**

Question 1ai.
Termination

Question 1aii.
Any two of:

- the individual has been meeting the National Physical Activity Guidelines (NPAG) for over five years
- physical activity is ingrained in their lifestyle
- the individual is unlikely to relapse.

Question 1b-c.

Marks	**0**	**1**	**2**	**3**	**4**	**Average**
%	38	28	19	11	4	**1.2**

Question 1b.
Aerobic training zone

This question was poorly done, with many students thinking that the answer was ‘steady state’.

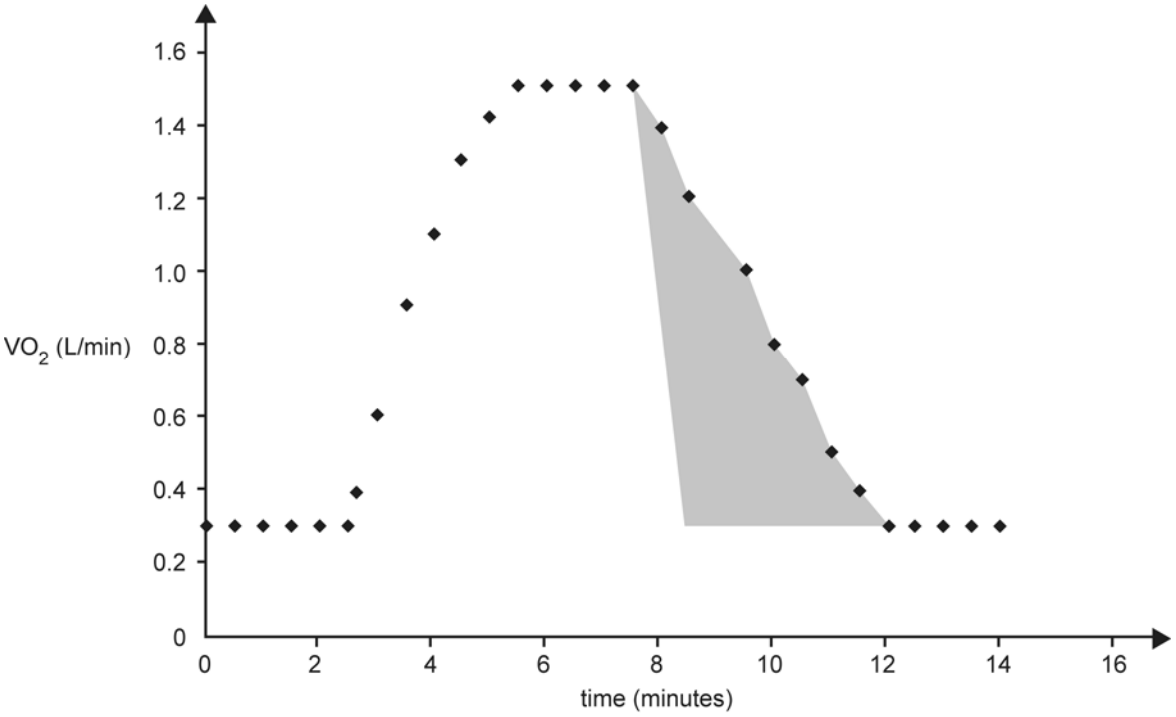
Question 1c.
As exercise is commenced, the initial demand for oxygen cannot be met as the acute changes to the respiratory and circulatory systems cannot occur quickly enough. As these systems adjust to the increased demands of the exercise, more oxygen is able to be taken in and used by the body. Oxygen supply equals oxygen demand and a steady state is achieved.

Many students restated the question in 1a. rather than state that the individuals were meeting the NPAG. Full marks could not be awarded to students who said that the individual was active for more than five years and was meeting the NPAG.

Question 2abi-ii.

Marks	**0**	**1**	**2**	**3**	**Average**
%	23	39	31	8	**1.3**

Question 2a.



Question 2bi.
Excess post-exercise oxygen consumption (EPOC) would increase

Question 2bii.
Elevated core temperature increases oxygen consumption which means an increase in EPOC.

Question 2c.

Marks	0	1	2	Average
%	73	12	14	**0.4**

Strategies to reduce EPOC include:

- lower core temperature
- undertake a passive recovery
- acclimatisation
- reduction in intensity of exercise
- more aerobic training.

Practical examples include:

- immersing the athlete in an ice bath
- placing cooling towels on the athlete
- re-hydrating the athlete with a cool drink
- having the athlete take a cold shower
- fanning the athlete
- sitting the athlete in the shade
- resting the athlete after exercise
- training the athlete in similar climates.

This question was poorly handled by students. They found it difficult to shade the area of EPOC. While many students understood that EPOC would increase in warmer temperatures, many were unsure of a strategy and practical example that could be used to reduce EPOC.

Question 3a.

Marks	0	1	2	Average
%	51	16	32	**0.8**

Muscle glycogen depletion which:

- reduces the rate of ATP formation
- leads to more oxygen required to oxidise fat
- increases ketane formation
- increases muscle acidity.

Students who did not receive full marks for this question were unable to link the cause of fatigue specifically to the event. It was a common mistake of students to think that when the glycogen was depleted the body relied on protein as a source of energy. The use of protein as a fuel in endurance events is negligible. Dehydration was also commonly thought to be a cause of fatigue in marathon runners and 400 m sprinters.

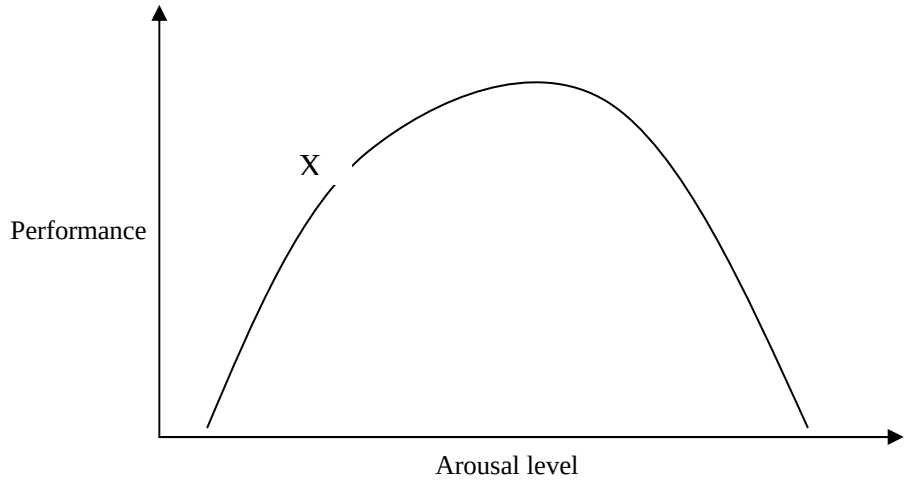
Question 3b.

Marks	0	1	2	3	4	Average
%	35	20	24	7	15	**1.5**

Metabolic accumulation (H+, Pi, and K+) interferes with metabolism, nerve excitability and muscle contraction.
Fuel (substrate) (PCr) depletion leads to a reduced rate of ATP formation.

Question 4

Marks	0	1	2	Average
%	66	8	26	**0.6**



Lleyton Hewitt would be under-aroused as he was behind in the match, he hit a good shot, and used positive self-talk to increase his arousal levels and improve his performance.

This question showed that students had a poor understanding of arousal. Many students thought that hitting one winner would put Lleyton Hewitt at the optimal level of arousal.

Question 5

Marks	0	1	2	Average
%	16	40	44	**1.3**

Long jumpers mentally rehearse their performance, from their starting stance, the run up, the take off from the front of the board, flight path and landing. It is important for them to picture themselves succeeding.

Imagery improves performance by:

- allowing the athletes to focus and eliminate distractions
- improving neural pathways between the brain and muscles

- providing a mental template of rehearsed sequences
- enabling athletes to practice and prepare for events and eventualities they are likely to encounter.

This question was well done by most students. To receive two marks students needed to give a specific example and explain how imagery can lead to improved performance. Students who only gained one mark generally did not give a specific example and used either diving or long jump.

Question 6
Part a of this question was done extremely well by students.

Question 6ai-iii.

Marks	0	1	2	3	Average
%	1	3	21	76	**2.7**

Question 6ai.
ATP-CP or Phosphagen energy system

Question 6aii.
Aerobic energy system

Question 6aiii.
30–35 seconds

Question 6b.

Marks	0	1	2	Average
%	55	18	27	**0.7**

All three energy systems are contributing energy at the 10 second mark but only the aerobic energy system is supplying energy at the 90 second mark.

This part of the question was done very poorly. Students did not use the graph and often wrote what appeared to be prepared answers relating to the interplay of the energy systems. Responses indicated they understood that in the first 10 seconds the anaerobic energy systems produce energy at the fastest rate but they did not link this to the data in the graph and the amount of energy released, or stipulate that there was a contribution from the aerobic energy system also at this time.

Question 7

Marks	0	1	2	3	Average
%	11	12	36	41	**2.1**

- Direct observation
- Objective
- Higher

Students who attempted this question performed well, however many students left it blank or missed it completely. It is imperative that students read the paper carefully to avoid missing questions.

Question 8
Once again the concept of lactate inflection point (LIP) caused great difficulty for students and this question showed that their knowledge needs to be improved. Even though the data was presented in a table as opposed to a graph, the basis for getting this question correct was an understanding of LIP. Students who understood that LIP is the point where lactate entry and removal from the blood is balanced were able to correspond this to the correct answer of 13km/hr in part ai.

A substantial number of students did not provide a range for the answer to part b and consequently could not receive any marks. A number of students also did not use the data provided for their answer and tried to calculate a heart rate using 85 per cent of HR max. Students who understood LIP were able to answer part c.

Teachers and students are reminded to refer back to the VCAA Bulletin – Clarification of content: Lactate inflection point (anaerobic threshold) for information regarding LIP.

Question 8ai–iii.

Marks	0	1	2	3	Average
%	29	14	52	6	**1.4**

Question 8ai.
13 km/hr

Question 8aii.
10–13 km/hr

Question 8aiii.
14–19 km/hr

Question 8b–c.

Marks	0	1	2	3	Average
%	25	35	37	3	**1.2**

Question 8b.
141–152 bpm

Question 8c.
When the lactate inflection point (LIP) is exceeded, lactic acid (metabolite) accumulates in blood faster than it can be removed. The increase in metabolites results in muscle fatigue, reducing the athlete's ability to sustain exercise.

Question 9a–b.

Marks	0	1	2	3	4	5	Average
%	16	18	18	21	16	12	**2.4**

Parts a and b of the question were reasonably well handled by students.

Question 9a.
Anaerobic Power, anaerobic capacity or speed

Question 9b.
ATP-CP system lasts for approximately 10 seconds, therefore more than half is used during each sprint interval. It takes 2–3 minutes for 98 per cent replenishment of CP stores and 30 seconds to replenish 70 per cent. Therefore, as the test progresses, each sprint interval will have less CP stores to create energy and the athlete will have to work at a lower intensity.

Question 9c–d.

Marks	0	1	2	3	4	Average
%	45	23	16	11	5	**1.1**

Question 9c.
Greater oxygen delivery allows for greater replenishment of ATP-CP stores between sprint intervals.
OR
Aerobic energy system will be used sooner, therefore there is less reliance on the lactic acid system and less accumulation of harmful by-products.

Students found it difficult to apply their understanding of VO_2max.

Question 9d.

- Resistance training – Power type activities using weights, to increase power when running
  OR
- Plyometrics – Increases the power of the strength shortening cycle thereby increasing the power to run, especially the take off for each sprint
  OR

- Short interval – Improves speed and the ability of the body to recover between short periods of high explosive work.

Students did not receive full marks if they did not stipulate the type of interval training required, for example, short. A common error was to suggest fartlek training as a suitable method to improve the results of this test.

Question 10a–bii.

Marks	0	1	2	3	Average
%	24	28	26	22	**1.5**

Question 10a.

Children should participate in at least 60 minutes (and up to several hours) of moderate to vigorous intensity physical activity every day.

Students did not receive any marks if they did not include all aspects of the National Physical Activity guidelines. Many did not include 'at least 60 minutes' and therefore did not receive any marks.

Question 10bi.

Mass media

Question 10bii.

One of:

- increase awareness of physical activity as a public health issue
- provide information about the health benefits of regular physical activity
- provide information about other non-health benefits of being active
- provide information about the consequences of inactivity
- increase peoples motivation to be physically active
- increase interest in physical activity participation and raising awareness of community-based programs.

Many students focussed on the purpose of the advertisement, for example, limiting screen time to two hours, instead of mass media campaigns in general.

Question 11a.

Marks	0	1	2	Average
%	10	30	60	**1.5**

Two of:

- lack of progress
- lack of confidence
- wanting to keep up with other athletes/be competitive
- pressure to win from coach, sponsors, public, self, family, etc.
- belief that there is no long-term harm
- belief they can get away with it
- influence from peers
- 'win at all costs' mentality
- financial rewards for winning.

Question 11b.

Marks	0	1	2	Average
%	29	37	34	**1.1**

Two of:

- less positive role models
- loss of respect for the sport
- decreased sponsorship
- decreased media coverage OR increased negative media coverage
- decreased participation in sport
- increased incidences of cheating and/or violence
- decreased community support of sport.

This question was well handled by many students. A common error was to relate the answer to the athlete and not to the sport.

Question 12

Parts a. and c. were very well answered by students. It was concerning how many students stated in inverse relationship between heart rate and oxygen uptake (that as heart rate goes up, oxygen uptake goes down). Those who understood the relationship failed to link it back to how it is used in testing.

Question 12a.

Marks	0	1	2	3	4	5	6	Average
%	4	5	10	16	21	19	25	**4**

Description of test	Component of fitness measured	Alternative recognised test specific to AFL
The player stands with his toes just before the start line. On the whistle, the player races 20 m as fast as possible past the end line.	Speed	50 metre sprint
Seven x 35 metre sprints separated by 25 seconds for recovery between each sprint. The times for each sprint are recorded.	Anaerobic capacity/power	Phosphate recovery test RAST test/repeated sprint test Repco peak power test Yo Yo test
Players are timed over a 3 km course.	Aerobic fitness	12 minute run 1.6 km run 20 m shuttle run or Beep test Step tests Treadmill tests
Player stands behind a line and jumps as far forward as possible. Distance is measured from where the back of the heels land.	Muscular power	Vertical jump
Player places feet on the start line and, on the whistle, sprints around the outside of the six cones.	Agility	Illinois agility run Semo agility test

Question 12b–c.

Marks	0	1	2	3	4	5	Average
%	5	9	22	34	22	8	**2.8**

Question 12b.

There is a direct linear relationship between heart rate and oxygen uptake. This means that sub-maximal tests can be performed and readings can be extrapolated to predict or estimate the VO_2 maximum.

Question 12c.

i. Higher
ii. Lower
iii. Lower

Question 13a.

Marks	0	1	2	Average
%	60	12	27	**0.7**

Vasodilation will occur following hot showers, and vasoconstriction, following an ice bath.

Question 13b.

Marks	0	1	2	3	Average
%	34	28	23	14	**1.2**

Repeated many times, a 'venous pump' action occurs, helping accelerate waste removal and nutrient delivery as compared to a passive recovery where lactic acid removal is slower.

Students demonstrated poor use of correct terminology in answering this question. Too many students stated that the muscles constrict and expand rather than the vascular system. Few students received full marks for part b as they only discussed contrast therapy and did not compare it to a passive recovery as stipulated in the question. When asked to make a comparison, students must comment on both factors.

Question 14a–b.

Marks	0	1	2	3	Average
%	34	29	23	14	**1.2**

Question 14a.
65–90 ml/kg/min

A range was not required but was not considered incorrect if given.

Question 14b.
Marathon runners want to peak or be in top form for major competitions (such as the Olympics, Commonwealth Games or World Championships). Tapering involves decreasing the volume of training completed in the days leading up to major competitions.

Question 14c.

Marks	0	1	2	Average
%	40	23	37	**1**

- Lee Troup may have a higher LIP, which means that he can work harder for longer before fatigue sets in
  OR
- Lee may have a larger percentage of slow twitch fibres which leads to better running economy
  OR
- Better dietary preparation or psychological preparation (mental toughness), or race strategies/coaching or training, which allowed Lee to be better prepared for the race.

Disappointingly, many students were unable to estimate the VO_2max. of an elite runner. This may be a reflection on students not completing fitness testing in class and comparing their results to norms. There was a distinct lack of understanding of peaking and tapering and how it would be incorporated into a training program.

Question 15
Question 15 was well answered by many students. The area of policy created the greatest difficulties for students. Many students gave policies that would not be realistic as they could not be enforced. For example, **make** people walk to work, shut down the lifts and **make** people use the stairs.

Question 15a–b.

Marks	0	1	2	3	4	Average
%	17	21	28	23	11	**1.9**

Question 15a.
One of:

- reduced absenteeism (reduced number of sick days taken)
- reduction in staff turnover
- improved self-efficacy
- stage of motivational readiness before and after intervention.

Question 15b.

Strategy		
Policy	**Social Environment**	**Physical Environment**
• Subsidise gym memberships for employees • Reduce insurance rates for active and fit employees	• Organise company fun runs/ride to work days, etc. • Establish lunchtime walking groups • Enter work team in sporting competitions	• Provide gym facilities • Provide showers and change rooms • Provide secure areas to lock up bikes • Put up signs to encourage stair use

Question 15ci-ii.

Marks	0	1	2	3	Average
%	30	5	17	49	**1.9**

Question 15ci.

No

Question 15cii.

The data does not provide information about the intensity, frequency or duration of the physical activity and therefore a conclusion about whether the individual has met the NPAG cannot be drawn.

Pedometers only measure steps, other physical activity may have been undertaken.

Question 16a.

Marks	0	1	2	Average
%	12	22	66	**1.6**

Two of:

- distances covered
- heart rate performance
- view actual path taken during session/game (movement patterns)
- duration, speed or intensity of activity
- time spent in different heart rate zones
- can calculate how much time is spent above LIP
- can calculate work to rest ratios.

Question 16b.

Marks	0	1	2	Average
%	27	34	38	**1.1**

GPS data can be used by fitness coaches to:

- analyse the fitness demands (energy systems and fitness components) of the game/activity/training session
- use this information to complete a battery of appropriate fitness tests, determine the player's strengths and weaknesses and then design a game-specific training program
- can be used in training sessions to ensure the player is replicating the demands of the game for example, work to rest ratio.

Question 16c.

Marks	0	1	2	Average
%	12	37	51	**1.4**

Compared to water, sports drinks:

- provide flavour and taste, therefore increased palatability which stimulates consumption
- include sodium which aids in the retention of consumed fluids so the thirst mechanism is not inhibited
- contain carbohydrates that aid in energy replenishment, which speeds up recovery
- can increase gastric emptying
- hypotonic drinks are absorbed faster than water and replace loss fluids more quickly.

This question was well handled by many students, although some did not understand the use of GPS in movement analysis and thought it was used for tracking a player's whereabouts. The most common error was in part c, and students could not receive full marks as they only listed a benefit of sports drinks and did not make the comparison to water.

Question 17a–b.

Marks	0	1	2	3	4	5	Average
%	42	19	16	10	7	6	**1.4**

Question 17a.
5–9 mins OR 23–27 mins

Question 17b.
Muscular

- Increase myoglobin
- Increased mitochondria density and number
- Improved oxidative capacity via increased oxidative enzymes
- Increased use of fat during sub-maximal exercise
- Increased stores and use of intramuscular triglycerides
- Increased muscle glycogen synthase and storage

These muscular changes make the muscle fibres better at extracting and processing oxygen which leads to an increase in a-VO_2 difference.

Vascular

- Increase capillary network
- Increase blood volume
- Increase haemoglobin or RBC

These vascular changes allow more blood to active muscles which leads to an increase in a-VO2 difference.

Again this year, many students were unable to distinguish between a muscular change and a vascular change and those who could list the adaptation were unable to explain how it had led to an improved arteriovenous oxygen difference.

Question 17c.

Marks	0	1	2	3	Average
%	22	17	42	19	**1.6**

Variation – three different types of training used (walk, swim, and Kokoda trail)
Frequency – training at least three times per week improves aerobic fitness, for example, swims once, walks twice and does the Kokoda Trail.
Duration – training sessions are greater then 20 minutes providing an aerobic benefit, for example, a 30 minute swim.

Students did not receive marks if they could not provide an example from the data to support their answer.

Question 17d.

Marks	0	1	2	Average
%	20	44	36	**1.2**

Advantages	Disadvantages
• Provides a strong association with energy expenditure • Provides a good description of several dimensions of physical activity among adults • Valid in laboratory and field base settings. • Easy to use	• Cannot be used for large groups • Influenced by other factors (for example, age, emotional stress and fitness level) • Changes to heart rate lag behind changes in physical activity • Limited in water-based activities • Can be uncomfortable when worn for extended periods of time • No context or type of activity

Chronic adaptations specific to the three systems, cardiovascular, respiratory and muscular, continues to be an area of concern for students. It is worth noting that 'type' is not a training principle and the correct answer was variety.

Question 18a–b.

Marks	0	1	2	Average
%	10	31	59	**1.5**

Question 18a.
1:3

Question 18b.
ATP-CP OR anaerobic glycolysis/lactic acid system

Question 18c–d.

Marks	0	1	2	3	Average
%	30	28	24	18	**1.3**

Question 18c.
One of:

- increase repetitions by one
- decrease rest time by 10 per cent between sets
- decrease group size by one participant
- increase distance by up to one metre.

Students were not awarded the mark if the answer was not specific to this training program. Rather than say 'increase distance', they needed to be specific about how big an increase was made. All changes to variables needed to be 10 per cent or less and specific to the program to receive a mark. There was a general improvement in students' responses in that they only changed one variable to apply overload.

Question 18d.
Two of:

- distance covered in 5 metre sprints, 21 x 3–6 metre sprints as shown in the activity analysis data
- the same movement patterns, for example, sprint forward/backwards
- the work to rest ratio is 1:3, therefore the correct energy system is being trained
- the same muscle groups are involved in touch rugby. For example, leg muscles required for sprinting
- the same fitness components/energy systems, for example, ATP-CP used for short sprints 1–3 metres, strength, speed, power required for sprinting, guarding and defending, etc.

Many students did not receive marks as they did not refer to the data provided.

Question 18e.

Marks	0	1	2	3	4	Average
%	54	19	19	4	4	**0.9**

Touch rugby player

- Develops power (through an improved myostatic stretch reflex and muscle stiffness) which increases force output (improves skills such as sprinting and passing).

10 km runner

- Not as much ATP is required for muscle contraction, therefore more economical.
- Increase the development of power to increase stride length or increase the sprint ability at the start or end of the race.
- Improved muscle stiffness and myostatic stretch reflex increased energy provided by muscle tendon recoil and reduces chemical energy needed, therefore increased economy.

This part proved to be very challenging for students and many found it difficult to state a benefit of plyometric training to a 10 km runner. Students needed to be recognise that while plyometrics may not usually be associated with endurance events, there are benefits to the athlete associated with performing this type of training.