VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2012 Physical Education GA 3: Examination

GENERAL COMMENTS

The 2012 Physical Education exam was accessible for most students. Students who had completed practical activities were able to draw on their experiences in their responses.

There is a growing trend for students to write everything they know about a concept without addressing the specific nature of the question. Students who were able to respond concisely to the questions and provide a response that addressed the question are more likely to achieve full marks.

The following information may assist teachers and students in preparation for Section B of the examination.

- Students who had participated in practical classes that supported the theoretical content of Physical Education were more likely to be able to demonstrate a comprehensive understanding of activity analysis, fitness testing, training principles and methods, and physical activity measures.
- Responses that gave all possible information about a concept and did not discern between relevant and irrelevant information did not receive full marks. Students are reminded to ensure their responses are specific to the question asked.
- Lactate inflection point (LIP) continues to be a difficult concept for students. Teachers are reminded to refer to the advice on LIP published in the April 2011 *VCAA Bulletin VCE, VCAL and VET*. This information is also available on the VCAA website via the Physical Education study page.
- An understanding of the physiological requirements of different events, types of training and chronic adaptations to training that will enable an athlete to develop lactate tolerance compared to improving LIP is very poorly understood by students.
- Simply stating 'interval training' is not sufficient; students must clarify the type of interval training required. For example, short interval training.
- Correct terminology is important for students to receive full marks. Accepted terminology is stated in the study design.
- Lactic acid is not an energy system. The correct terms for the three energy systems are the ATP-CP system, anaerobic glycolysis and the aerobic energy system.

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	3	91	2	3	
2	4	2	79	15	
3	36	8	3	53	Options A and B were accepted, as the diuretic effect of the caffeine contained in a cola drink varies depending on the training and regular usage of caffeine by the athlete. Athletes who regularly ingest caffeine are less likely to experience the diuretic effect of a cola drink.
4	13	23	37	27	Plyometric exercises utilise the stretch reflex, which involves a rapid eccentric contraction followed by a concentric contraction, which generates a maximum force in a short period of time.
5	9	8	60	23	
6	6	15	36	43	
7	2	20	74	3	

 © VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY 2013

Question	% A	% B	% C	% D	Comments
8	26	27	42	5	Students had difficulty with this question. Knowledge of chronic adaptations to endurance training was required to be able to identify that increased venous return, cardiac hypertrophy and cardiac contractility would result in an increased stroke volume at rest and during submaximal exercise.
9	5	7	79	9	
10	3	81	4	12	
11	14	79	3	4	
12	20	17	45	19	
13	18	5	67	10	
14	2	4	82	12	
15	31	44	9	16	

Section B – Short-answer questions

This report provides sample answers or an indication of what the answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

Question 1

Students who were able to identify from the graph that the changes were a result of anaerobic training were usually then able to state that the changes were more likely to occur in fast-twitch muscle fibres. Few were able to justify why these changes would occur in fast-twitch fibres. Students were required to provide evidence from the data to support their answer and demonstrate an understanding of the characteristics of the fibre type that would result in the chronic adaptations show in the graph as a result of anaerobic training.

1a.

Marks	0	1	Average
%	43	57	**0.6**

Anaerobic training

1bi–ii.

Marks	0	1	2	3	4	Average
%	29	16	22	22	11	**1.7**

1bi.

Fast-twitch fibres

1bii.

Anaerobic training produces increases in the characteristics shown in the graph, such as PC stores and glycolytic capacity in fast-twitch fibres.

Fast-twitch fibres are more suited to high-intensity activities that require greater force production/power output.

By increasing the factors shown, the fast-twitch fibres have more fuel available (increased CP and glycogen stores), increased ATP turnover and energy release (ATPase and glycolytic capacity).

Question 2

2a.

Marks	0	1	2	3	Average
%	25	31	33	11	**1.3**

All three energy systems provide energy for both events; however, the 400-m event is longer and therefore has a greater contribution from the aerobic system to provide energy. The aerobic energy system cannot provide ATP at the same rate as the anaerobic energy systems, so the pace for the 400-m event must decrease.

Students needed to identify that all three energy systems will provide energy in both events. They then needed to relate the rate of energy production to the dominant energy system of the 100-m and 400-m events to show an understanding of why the 100-m pace cannot be maintained for 400 metres. Many students wrote every characteristic of each of the three energy systems but did not use their understanding of these characteristics to answer the question.

2b.

Marks	0	1	2	3	4	5	6	Average
%	15	4	9	14	24	20	13	**3.4**

100 m: passive recovery
During passive recovery the athlete rests and PC is not required for energy production, which allows for the resynthesis of ATP-CP (approximately 98 per cent of PC restored in 3 minutes).

400 m: active recovery
Active recovery involves low-intensity activity that maintains blood flow and oxygen levels, which speed up the removal of accumulated metabolic by-products and/or prevents venous pooling and promotes venous return to the heart and/or creates a muscle pump that increases oxygen supply to remove waste products.

Students were generally able to identify the correct type of recovery for each event and provide a description of how this assisted in returning the body to pre-exercise levels.

Question 3
While many students were able to state in Question 3a. that the decision was made at the policy level, many went on in 3b. to describe the impact on food choices, not physical activity levels as stated in the question. If students could outline a school-based change at the policy level in Question 3c., they were generally able to provide an example of how this would affect physical activity levels. Policies needed to be realistic and able to be implemented. Good responses demonstrated an understanding of how the change could affect physical activity behaviours in a school setting. Question 3d. was poorly done. Responses suggested that many students didn't read the requirements of the question.

3a.–b.

Marks	0	1	2	3	Average
%	16	28	31	25	**1.7**

3a.
Policy

3b.
Removal of the funding for the program may decrease the opportunities for students to be physically active and therefore may decrease their physical activity levels.

3c.i–ii.

Marks	0	1	2	Average
%	41	14	45	**1.1**

Mandated PE classes: compulsory PE classes would allow students to increase their skill level and learn different ways to be active. This may encourage students to be active outside of school.

Other suitable examples included: specified play areas for different year levels, health and PE in the curriculum, house/interschool sport involvement, lunchtime oval usage policy, sports uniform policy, supervision of active play, issuing of sports equipment at lunch and recess, and how they could increase physical activity levels.

3d.

Marks	0	1	2	3	Average
%	31	28	24	17	**1.3**

The following are examples of suitable responses.

- Physical activity behaviour is more likely to be changed if the intervention or program targets multiple levels of the social-ecological model. In a school setting, if there is insufficient space or equipment (physical environment) or a lack of qualified PE teachers (social environment), even with mandated PE and sport (policy), students (individual) may not change their involvement in physical activity.

- Physical activity behaviour is more likely to be changed if the intervention or program targets multiple levels of the social-ecological model. If students have access to facilities and equipment (physical environment) and can participate in compulsory sport (policy) with their friends (social environment), they are more likely to enjoy the experience (individual factor). All of these factors work together to influence behaviour and increase the physical activity levels of the students.

Question 4a.

Marks	0	1	2	3	Average
%	7	15	33	45	**2.2**

Sports drinks can rehydrate, refuel, replace electrolytes and are more palatable than water. Water only replaces fluids. Therefore sports drinks, or water and sports drinks in combination, would be the most suitable form of hydration.

This question was handled well by many students. Generally, students were able to identify the roles that water and sports drinks play in hydration. Some students did not make a recommendation as to the most suitable form of hydration.

4b.

Marks	0	1	2	3	Average
%	15	45	32	9	**1.4**

It is important to follow this recommendation because water

- reduces the concentration of the gel as the high CHO concentration in the stomach may cause gastric upset
- increases absorption rates
- reduces the risk of dehydration.

Question 5a.

Marks	0	1	Average
%	80	20	**0.2**

Activity analysis/data collection/games analysis

Most students were unable to identify that the correct answer was an activity or games analysis, and consequently could not explain the impact of not doing this step. It is a requirement that all students conduct an activity analysis as part of their training program, and it was evident that many students had not completed this practical activity.

5b.

Marks	0	1	2	3	Average
%	68	11	11	9	**0.6**

By not completing the activity analysis, movement patterns, duration, skill frequencies and intensity levels/heart rates will not have been recorded. Without this information the training program cannot be made specific to the requirements of the sport (muscle groups, energy systems, W:R, etc.).

5c.

Marks	0	1	2	Average
%	19	52	30	**1.1**

Strength is specific to the muscle group; one test cannot be used to measure the overall strength of her body, so individual tests need to be undertaken for each muscle group where strength is required. This allowed Charlotte to identify weaknesses and target specific muscles in her training program.

Many students were able to identify that strength is specific to each muscle group.

5d.–e.

Marks	0	1	2	3	Average
%	14	14	27	44	**2**

5d.
Suitable exercises included: crunches, sit-ups, bridge/plank, toe taps, V-sit crunch, t-cups (with weight), leg raises, slow abs and reverse sit-ups.

A common error was to draw or describe a whole circuit, not just an exercise that could be done in a circuit. Students are reminded to read questions carefully.

5e.
Increase the number of repetitions and/or decrease the intensity/weight

Students demonstrated a good understanding of the difference between strength and endurance.

Question 6
This question was generally well handled by students. Most could provide an example of how the workplace targets the individual, even if they were unable to define the component in Question 6ai.

6ai.–ii.

Marks	0	1	2	Average
%	13	52	34	**1.2**

6ai.
Individual factors are personal factors that increase or decrease the likelihood of an individual being physically active. For example, knowledge, attitudes, perceived barriers, motivation, enjoyment, skills, age, gender, level of education and socioeconomic status.

6aii.
Suitable examples include increasing employees' knowledge about being more active (Active April), having personal trainers to mentor employees can be positive influences on changes to behaviour, perceived barriers are removed (24/7 gym), attitudes, self-efficacy, socioeconomic status, skill level, etc.

6b.

Marks	0	1	2	3	Average
%	30	24	31	14	**1.3**

- Social environment: adherence and motivation can be affected if friends/peers are no longer able to use the facilities.
- Physical environment: reduces access to facilities.
- Individual: the socioeconomic status of the individual may mean that they can no longer afford to use the gym or there is a change in their attitude to physical activity because of the reduced access.

Students needed to understand that the removal of the subsidy was a policy decision and then comment on the impact of this decision on the individual, environment and social levels. Many students talked about removing the gym, rather than the subsidy.

Question 7

7a.–b.

Marks	0	1	2	3	4	Average
%	37	22	24	9	7	**1.3**

7a.

Either of

- increased speed of recovery, which enables athletes to train more often as recovery between training bouts is quicker
- increased intensity, frequency and length of training sessions – the athlete gets more out of training each time they train.

7b.

Steroids are synthetic drugs imitating testosterone. Males already have large quantities of testosterone, whereas females have very small quantities, therefore the side effects (such as facial/body hair, aggression, deep voice) of steroids are greater in women.

Students needed to establish that anabolic steroids increase testosterone levels and because females have relatively low levels to begin with, the increase causes more pronounced side effects. Identifying only the side effects was not sufficient.

7c.–d.

Marks	0	1	2	3	4	Average
%	8	27	37	22	7	**1.9**

Students with a thorough understanding of the WADA rationale were well rewarded in Questions 7c. and 7d.

7c.

To promote (doping-free sport, health, fairness and equality) and to coordinate and monitor (detection, deterrence and prevention) the fight against doping in sport

7d.

The criteria that WADA uses when determining substances to include on the prohibited list are that the substance and methods are proven by medical science to enhance performance, pose a threat to the health of athletes and are considered to violate the spirit of the sport. Both anabolic steroids and protein supplementation enhance performance, but protein poses no threat to the health of the athlete and does not violate the spirit of the sport, so it is not banned.

7e.

Marks	0	1	2	Average
%	39	32	29	**0.9**

Diuretics promote urine excretion and dilute the concentration of the drug in the body, making it harder to detect.

Students discussed diuretics ‘flushing out’ the drug without demonstrating any understanding of what this meant. The use of correct terminology is imperative for students to receive full marks.

While diuretics were the most common example of a masking agent provided by students, other examples such as epitesterone and plasma volume would also have been acceptable.

Question 8

Most students were able to identify the correct energy system for each event. A common error was to state ‘anaerobic’ for the 500-m time trial, rather than anaerobic glycolysis.

Some students and teachers are still using the term ‘lactic acid system’. This is an inaccurate and outdated term that does not accurately describe the release of energy from glycogen in the absence of oxygen. While students were not penalised for using this term in the exam, from 2013 it will no longer be an acceptable term for anaerobic glycolysis.

8a.–b.

Marks	0	1	2	3	4	5	Average
%	6	8	31	31	18	6	2.7

8a.
500 m: anaerobic glycolysis
3000 m: aerobic energy system

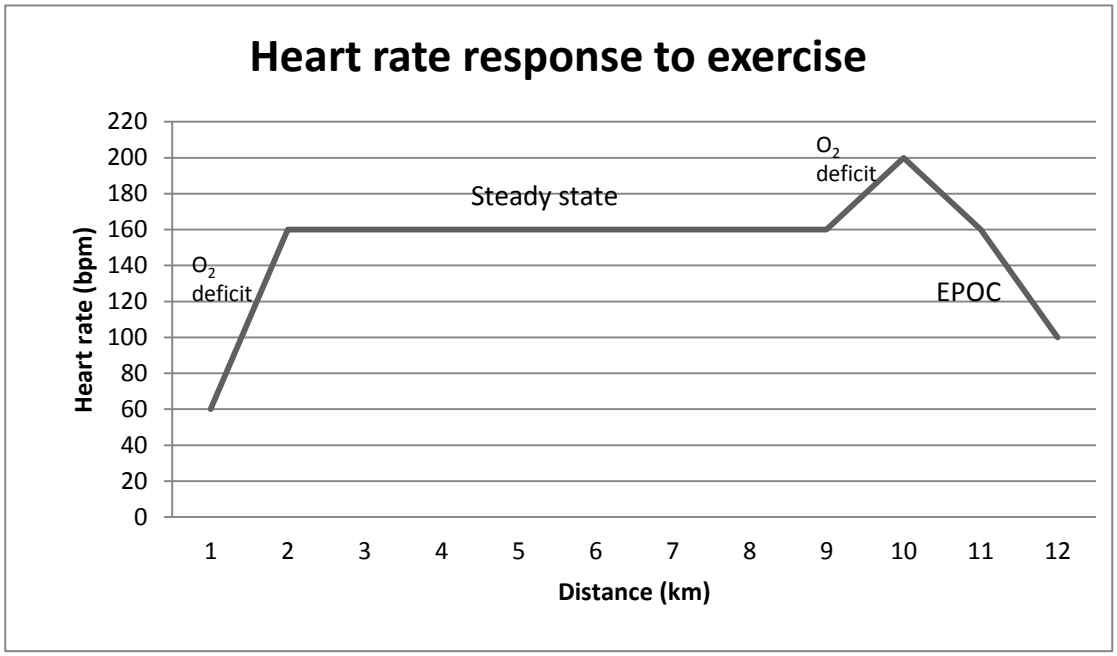
8b.
While the 500-m event is predominately anaerobic, the 3000-m event would rely heavily on the energy contribution from the anaerobic systems (particularly the start and the sprint). The capacity of the anaerobic systems is finite, but if an athlete can increase this capacity they are able to derive more energy from these systems, which allows a higher rate of energy production and this allows the cyclists to go faster in both events. Anaerobic capacity training increases lactate tolerance, allowing the athlete to work at maximal intensities for longer periods.

This question was challenging for students. Many students discussed aerobic benefits to training, even though the question clearly stated training anaerobic capacity. Students were unable to make the link between increased anaerobic capacity and being able to sustain high intensities due to an increased tolerance to the accumulated lactate. Students continue to confuse tolerance with LIP, and do not understand that an increase in LIP is an aerobic adaptation and increased tolerance to lactate is an anaerobic adaptation.

Question 9
This question was generally well done by most students. Common errors included not labelling the graph and identifying only one period of O_2 deficit. In 9b. too many students described the whole graph, perhaps not reading the question properly. Questions 9c.–.e were handled well, demonstrating a good understanding of overload and fartlek training.

9a.

Marks	0	1	2	3	4	Average
%	16	14	17	31	22	2.3



9b.

Marks	0	1	2	Average
%	38	35	27	**0.9**

- When the body begins to exercise, it takes the heart and lungs time to adjust to the increased demand for oxygen and the heart rate increases.
- In this period of time the required energy is provided by the anaerobic energy systems (oxygen deficit).
- When the cardiorespiratory mechanisms have adjusted to supply the oxygen to meet the demand, no further rise in heart rate occurs (steady state).

9c.–e.

Marks	0	1	2	3	4	5	Average
%	14	12	15	19	21	18	**2.8**

9c.

Either of

- EPOC is directly influenced by periods of work where the athlete is in O_2 deficit (increased contribution from the anaerobic energy systems). Therefore, if the athlete maintains a steady state in the final 500 meters, EPOC will be reduced
- EPOC will increase and take longer to return to resting levels if the athlete sprints the final 500 metres, due to the increased contribution from the anaerobic system.

9d.

Suitable answers included: increase the distance or time of the run by no more than 10 per cent, i.e. running an extra 1km, running up hills or on sand, decrease the time taken to run the same distance, increase the final sprint to 550 metres.

9e.

Long interval training or fartlek training – shorter distances more specific to football, with changes in intensity from high to low

Question 10

Many students demonstrated an understanding of lactate production equalling removal; however, a common error was to assume that because oxygen supply equalled demand and the athlete was in steady state, the lactate levels would not increase. Lactate is produced under fully aerobic conditions and the inflection point is not due to an insufficient oxygen supply. Students incorrectly stated that anaerobic training (for example, short interval) would be beneficial for increasing LIP.

10a.–b.

Marks	0	1	2	Average
%	27	45	28	**1**

10a.

During sub-maximal exercise, the body is able to remove the lactate at a similar rate as it is produced.

10b.

Aerobic/continuous/endurance training/long interval training/fartlek training

10ci–ii.

Marks	0	1	2	3	4	Average
%	29	31	25	12	3	**1.3**

10ci.

Graph C

Many students were able to identify the correct answer. However, few students were able to justify this with reference to chronic adaptations to the cardiorespiratory system (such as increased mitochondria mass, increased capability to oxidise fats and CHOs), which would lead to an increase in both LIP and VO_2 max, as shown in the graph.

10cii.
With 12 weeks of aerobic training, chronic adaptations to the cardiovascular, respiratory and muscular systems will occur. Therefore, fewer H+ are produced (reduced accumulation of by-products of anaerobic metabolism), which allow the athlete to work aerobically at higher intensities (speed) for longer periods before reaching their lactate inflection point (LIP). This is shown by the shift to the right of the curve on the graph.

Question 11
This question was reasonably well handled by students. Good responses gave specific reference to what Ian Thorpe would imagine. Students demonstrated a good understanding of the 'inverted-U' hypothesis. A common error was to explain arousal levels without reference to the hypothesis.

11a.

Marks	0	1	2	Average
%	14	41	45	**1.3**

Because Ian Thorpe has experienced success at the highest level in the past, he is able to use images such as seeing himself standing on the podium receiving his gold medal, seeing himself on the starting blocks, feeling the crowd, the feeling of touching the wall and seeing his time on the screen as he looks up.

11bi–ii.

Marks	0	1	2	3	4	Average
%	13	15	25	27	20	**2.3**

11bi.
Suitable answers included lethargy, easily distracted, lacks enthusiasm and motivation, moves slowly, lack of concern about performance, distracted by irrelevant cues.

11bii.
The 'inverted-U' hypothesis suggests that there is an optimal level of arousal for optimal performance. Being over- or under-aroused will have a negative effect on performance.

Question 12
This question was well answered by students. However, many were unable to determine that the Yo-Yo test is more specific to team sports as it has periods of high and low intensity, and incorporates a rest recovery.

12a.–b.

Marks	0	1	2	3	Average
%	14	31	30	26	**1.7**

12a.
Aerobic capacity

12b.
The Yo-Yo test incorporates a recovery. The active recovery simulates the high and low intensity demands of the team sports better than the continuous nature of the beep test.

12c.–d.

Marks	0	1	2	3	Average
%	42	32	17	9	**1**

Questions 12c. and 12d. proved difficult for students. Students who had not performed fitness tests were disadvantaged.

12c.
Suitable answers included: Cooper 12-minute run, 1.6-km run, Harvard step test, PWC 170 and submaximal cycle test (Astrand or YMCA).

The 3-km and 5-km time trials are not recognised tests as they do not have nationally based norms.

12d.
A VO_2 max test is a direct measure of VO_2 max.

A 20-m shuttle run is an indirect measure as the results from the test are used to predict the VO_2 max of the subject. Students stated accuracy as the main difference between the two tests and failed to recognise that a laboratory test will measure VO_2 max and a field test will predict VO_2 max.

12ei.–ii.

Marks	0	1	2	3	Average
%	42	23	21	14	**1.1**

Many students stated that the cause of fatigue was metabolic by-products and did not clarify that it is the accumulation of the metabolic by-products that causes fatigue.

12ei.
Accumulation of hydrogen ions and/or inorganic phosphates and/or metabolic by-products

12eii.
A greater aerobic capacity will delay this fatigue as the athlete can continue to work aerobically at higher running speeds, meaning less reliance on the anaerobic systems and the later the subject passes their lactate inflection point. With a greater aerobic capacity, the ability to oxidise lactate is increased, therefore delaying the accumulation of the metabolic by-products (H+ and inorganic phosphates) and the onset of this type of fatigue.

Question 13
Many students gave the same response to each part of this question, reflecting a superficial understanding of the content. Students demonstrated limited understanding of how physical activity levels are measured, again suggesting that many students had not participated in this type of practical activity.

13a.

Marks	0	1	2	3	Average
%	20	39	31	9	**1.3**

Questionnaires are subjective measures of physical activity and have reliability and validity issues associated with social desirability bias, memory limitations and misinterpretation of physical activity activities. Participants are more likely to overestimate their physical activity in a questionnaire, whereas accelerometers are objective and measure movement in real time. This is seen in the graph, where vigorous and moderate physical activity are greater when measured by the self-report.

13b.

Marks	0	1	2	3	Average
%	15	18	36	31	**1.9**

A self-report

- can record qualitative and quantitative data
- is quick and easy to administer
- is a more accessible method of physical activity measurement
- has a low subject burden
- is cost-effective
- is good for large populations.

13c.

Marks	0	1	2	3	Average
%	46	23	23	8	**0.9**

- The data collected would not be useful and it would be an ineffective way to measure change in physical activity and sedentary behaviour over eight weeks.
- The same method needs to be used to determine change over time.
- Unable to tell from the data if there is any actual change in behaviour.
- Given the differences seen in the graph between the two methods, an error would be expected, and not to detect actual changes because the two measures report different data.

Question 14

Students found Questions 14a. and 14b. particularly challenging. Many were unable to identify a decrease in heart rate as a result of endurance training and incorrectly assumed that cardiac output didn't change at rest pre- and post-training as oxygen requirements were unchanged. In 14b., few students knew that stroke volume peaks submaximally and any further changes in cardiac output are due to an increase in heart rate. Many students were able to identify the correct percentage of maximum heart rate but had difficulty providing reasons for their selection.

14a.

Marks	0	1	2	Average
%	67	10	23	**0.6**

A chronic adaptation to endurance training is a decrease in resting heart rate (HR), so cardiac output (Q) = stroke volume (SV) × HR, therefore an increase in stroke volume and a decrease in heart rate gives no overall change to cardiac output.

14b.

Marks	0	1	2	Average
%	43	45	12	**0.7**

The increase in cardiac output at maximal intensity is due to an increase in heart rate as stroke volume peaks at submaximal levels.

14ci.–ii.

Marks	0	1	2	3	Average
%	30	25	22	24	**1.4**

14ci.

Lower percentage of maximum heart rate

14cii.

At the same speed submaximally, the trained athlete will be able to pump more blood per beat (more efficient cardiorespiratory system) due to an increase in stroke volume. This means that heart rate post-training will be lower. The subject is working at a lower intensity to supply the working muscles with the required oxygen.