2014 Examination Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2014 Physical Education GA 3: Examination

GENERAL COMMENTS

The 2014 Physical Education examination was handled well by many students, but there were some students who found the examination challenging. However, students who were able to construct their responses succinctly in order to address the specific requirements of the questions using correct terminology were rewarded for their ability to demonstrate understanding and application of knowledge. Students who participated in practical activities and were able to link practical experiences to their written responses performed well.

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

- Energy system interplay is dependent on the intensity and duration of the activity. An explanation of energy system interplay needs to be specific to the activity provided.
- An understanding of chronic adaptations to aerobic training that lead to an improved lactate inflection point (LIP) continues to be poorly understood by students. Insufficient oxygen supply has not been shown to cause the LIP. Teachers are reminded to refer to the advice on LIP published on the Physical Education study page of the VCAA website.
- Students need to be able to make the distinction between the measurement of physical activity and the measurement of fitness components. The methods for assessing physical activity and sedentary behaviour are different from the methods used to test fitness components, and each has their advantages and limitations.
- When a question asks students to refer to, or use, the data provided, full marks will not be awarded if students do not use the information provided in their response. Use of data can mean reference to the information provided in a graph or table, actual numerical data or reference to a relationship as shown in a graph.
- Use of correct terminology is important for students to receive full marks. Accepted terminology is stated in the study design.
- Questions that require students to provide an outline require more than one- or two-word responses.

SPECIFIC INFORMATION

Note: Student responses reproduced in this report have not been corrected for grammar, spelling or factual information.

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

The statistics in this report may be subject to rounding errors resulting in a total less than 100 per cent.

Section A – Multiple-choice questions

Question	% A	% B	% C	% D	Comments
1	1	4	94	0	
2	1	89	4	7	
3	90	7	2	1	
4	26	49	14	10	
5	5	2	13	81	
6	2	6	55	37	
7	41	7	48	4	
8	2	26	27	45	The lactic acid produced during submaximal exercise is oxidised and used as a metabolic fuel for exercise. During recovery, a small portion of lactic acid is converted to glycogen in the liver and muscles.
9	87	5	6	2	
10	3	22	17	58	
11	6	22	54	17	
12	11	34	41	14	Carbohydrate loading leads to an increase in water storage for athletes.
13	18	32	11	38	The Australian Sports Anti-Doping Authority's (ASADA) rationale to adopt the World Anti-Doping Agency (WADA) requirements include health, safety, fairness, role modelling for children and the maintenance of the spirit of the sport.

Question	% A	% B	% C	% D	Comments
14	19	10	48	24	
15	87	7	4	2	

Students handled the multiple-choice section of the examination reasonably well.

Section B – Short-answer questions

Question 1

Marks	0	1	2	3	4	Average
%	22	24	24	22	9	**1.7**

Advantages

- excellent quantitative and qualitative information recorded
- useful in school and community settings
- contextual information can also be collected
- all dimensions of physical activity can be measured (for example, frequency, intensity, duration and type of activity)

Limitations

- hard to use with large populations
- labour intensive and time-consuming
- high reactivity – the presence of an observer may affect the behaviour of those being observed
- cost – because of the time and labour involved in training and recording information

Students commonly related their answers to an activity analysis or the measurement of fitness components and not the assessment of physical activity as stated in the stem of the question.

Question 2

Marks	0	1	2	3	Average
%	27	10	24	39	**1.8**

Matthew was correct. An activity analysis is required to determine the relevant muscle groups and/or fitness components and/or energy systems so that the appropriate fitness tests can be selected to test the relevant fitness components specific to the sport undertaken.

This question was generally well handled by students.

Question 3

Parts a. and b. were reasonably well done by students. In part c., many students were unable to identify potential harms associated with high-altitude training. This may reflect the misconception that if a method or substance is legal it is not potentially harmful to the athlete.

3a.

Marks	0	1	2	Average
%	28	39	33	**1.1**

Increased (two of):

- erythropoietin (EPO) production
- red blood cells
- haemoglobin
- oxygen-carrying capacity
- muscle and tissue capillarisation
- buffering capacity
- oxidative capacity
- myoglobin concentration
- mitochondrial density

- VO_2 max.

3b.

Marks	0	1	2	3	Average
%	32	26	26	16	**1.3**

By training at high altitudes, the body compensates for the lower oxygen levels by increasing the secretion of the hormone erythropoietin (EPO). This triggers the production of more red blood cells and promotes a greater haemoglobin oxygen-carrying capacity and delivery to the working muscles.

3c.

Marks	0	1	2	Average
%	56	35	9	**0.6**

Any two of:

- altitude sickness
  - lethargy
  - headaches
  - nausea (vomiting)
  - feeling faint or lightheaded
- dehydration
- respiratory tract infections
- decreased immune system
- decreased blood flow to the brain
- sleeplessness/insomnia.

Question 4ai.–ii.

Marks	0	1	2	3	4	Average
%	5	19	38	28	11	**2.2**

In part a., students were able to identify that the black column represented the anaerobic contribution to the activity. However, few used the data provided to support their answer and were therefore not awarded full marks. Part b. challenged students as many were unable to demonstrate an understanding of the role of the anaerobic systems (both ATP-CP and anaerobic glycolysis) in a predominately aerobic event.

4ai.

Black

4aii.

The 200 m and 400 m events are shorter duration, higher-intensity events. The anaerobic energy system would contribute the majority of the energy, as the demand for ATP is high and the anaerobic energy systems produce ATP at the fastest rate. This is shown by the 70% and 57% contribution to these events from the anaerobic system (black column) compared to the 30% and 43% from the aerobic system.

4b.

Marks	0	1	2	3	4	Average
%	19	31	31	14	5	**1.6**

The anaerobic systems contribute a small percentage to the total energy requirement in the 1500 m event (approximately 16%). The aerobic energy system takes time to respond (for example, increased heart rate and respiratory rate) to the energy demands of the event. The anaerobic systems provide the required ATP during oxygen deficit at the start of the race until the energy demand can be met aerobically, and will increase their contribution during surges and the final acceleration to the finish line.

Question 5

Marks	0	1	2	3	Average
%	16	16	33	35	**1.9**

Students were able to identify a suitable nutritional supplement (most commonly protein) to increase power. Students awarded full marks were able to explain how the supplement may increase performance.
Nutritional supplements or aids included (any one of):

- creatine monohydrate
- caffeine
- bicarbonate loading
- protein supplements.

creatine monohydrate

- increase phosphocreatine and muscle creatine levels, which enhance ATP regeneration to improved repeat high-intensity or sprint ability, increased training intensity and frequency

caffeine

- stimulation of release of and activity of adrenaline, central nervous system effects, including reduced perception of fatigue and maintaining a longer period of optimal pacing and increased muscle contractility

bicarbonate loading

- increased blood bicarbonate concentrations and pH enhance the buffering capacity of the extracellular space, allowing greater lactate and H^+ ion production before muscle function is inhibited

protein supplements

- used for muscle growth and repair, allowing for increased training intensity and frequency and an increased muscle cross-sectional area, leading to PC storage, greater strength and power
- promotes glycogen resynthesis for increased fuel availability
- facilitates nerve impulse transition, resulting in more forceful muscular contractions

Question 6
Most students were able to identify that School 1 addressed more levels of the social-ecological model and consequently had greater success in increasing the physical activity levels of the Year 7 students in part a. In part b., many students failed to acknowledge that the measurement of physical activity occurred during school hours. Part c. was well answered. Students demonstrated a good understanding of the individual level of the social-ecological model.

6a.

Marks	0	1	Average
%	27	73	**0.7**

School 1 targeted multiple levels of the social-ecological model (policy, physical environment and social levels).

6b.

Marks	0	1	2	3	Average
%	35	43	16	5	**0.9**

Both schools targeted the policy level (mandated physical education and sport), resulting in the increase in physical activity levels during school hours (from 150 minutes to 200 minutes). School 2's active transport policy will not increase the physical activity time as the initiative does not increase physical activity **during** school hours.

6c.

Marks	0	1	2	Average
%	32	23	45	**1.2**

Mandated physical education and sport:

- increases knowledge of the benefits of physical activity
- develops skills
- exposes students to various sports
- increases self-efficacy
- increases confidence to perform physical activity
- increases motivation to be active
- increases self-belief

- improves attitude/behaviours toward physical activity, increasing the likelihood of the Year 7 student being active.

Question 7

Responses showed that students found part a. and b. of this question very challenging. Few demonstrated an understanding of the chronic adaptations to aerobic training that lead to an increase in the lactate inflection point (LIP). In part c., students were generally able to link an increase in exercise intensity to the rapid onset of fatigue.

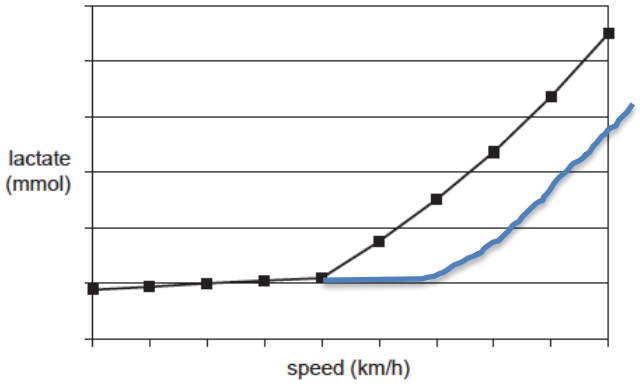
7a.–b.

Marks	0	1	2	3	4	5	Average
%	22	34	24	13	6	2	**1.6**

7a.

Aerobic training leads to an increase in mitochondrial size and number and an increased capability to oxidise fat and carbohydrate, leading to an increase in LIP. The body can therefore work aerobically at higher intensities before the production of lactate exceeds removal.

7b.



The curve needed to show a shift to the right and be below the line given.

7c.

Marks	0	1	2	3	Average
%	31	25	26	18	**1.2**

At exercise intensities beyond LIP, lactate entering the blood exceeds removal and begins to accumulate rapidly. The accumulation of by-products associated with anaerobic metabolism is associated with a more rapid onset of fatigue.

Question 8

Knowledge of this training principle was not evident in many student responses to part a. In parts b. and c., the advantages and suitable intensities of different continuous training methods for trained and untrained runners proved to be difficult. Students exhibited a superficial understanding of aerobic training methods and were unable to demonstrate depth of understanding when asked to consider two different forms of aerobic training. Participation in the training program may assist student understanding of these concepts.

8a.

Marks	0	1	Average
%	52	48	**0.5**

Diminishing returns

8b.

Marks	0	1	2	Average
%	83	16	1	**0.2**

Suitable responses included the following.

- Continuous training is ideal for a beginner starting a fitness program as it is less demanding and the intensity is less compared to long interval training.
- Long interval training requires greater knowledge of training principles, which an untrained runner may not have.
- Continuous training still provides health benefits and/or develops the aerobic system but has less chance of injury compared to long interval training.

8c.

Marks	0	1	2	3	Average
%	44	33	17	6	**0.9**

75–90 % of HR max.

Due to chronic adaptations, a trained runner will train at intensities close to their LIP. As they are able to work at higher intensities aerobically without accumulating fatiguing by-products, they can run at higher speeds to improve their time in the 5 km run.

Question 9

Students who did not use the information provided in the graph were not awarded full marks in parts a. and b. Chronic adaptations were generally well understood. Students were able to explain the changes in oxygen supply and demand at various stages of the test in part c.

9a.

Marks	0	1	2	3	Average
%	64	17	12	7	**0.6**

The values given are absolute as they are measured in L/min (as shown on the graph).

When comparing the VO_2 max of the two runners, a relative measure is more appropriate as it takes into consideration the weight of the individual, and therefore the amount of oxygen taken in and utilised per kilogram per minute can be compared.

9bi.

Marks	0	1	2	Average
%	9	40	50	**1.4**

Female 2 is the trained runner because of the (one of):

- higher VO_2 max (3.5 L/min) compared to Female 1 (2.7 L/min)
- increased time she performed the test (17 minutes compared to 12 minutes).

9bii.

Marks	0	1	2	Average
%	24	17	59	**1.4**

Suitable answers included the following.

- Increased ventricle size, stroke volume, cardiac output, blood volume and haemoglobin allow for an increase in oxygen-carrying capacity of the blood so more oxygen can be delivered to the working muscles.
- Increased capillarisation – greater diffusion at the muscles means that more oxygen can be supplied to the working muscles.
- Increased a-vO_2 diff. – increased diffusion and blood delivered to the working muscles means that greater amounts of oxygen are extracted by the muscles.

9c.–d.

Marks	0	1	2	3	4	5	Average
%	6	13	17	24	23	16	**2.9**

9c.
From 12 to 14 minutes the runner is at steady state where oxygen supply equals oxygen demand. Between 14 and 15 minutes the energy requirements (intensity) of the exercise increases and the oxygen demand is now greater than supply, resulting in an increased contribution from the anaerobic energy systems.

9d.
Suitable answers included:

- Coopers 12-minute run
- 20 m shuttle run (beep) test
- 1.6 km run test
- Yo-Yo test.

9e.

Marks	0	1	2	Average
%	73	20	7	**0.4**

The limiting or fatiguing factor for cycling is more likely to be local muscle fatigue in the legs, meaning the test is terminated due to this fatigue and not a limitation of the body to uptake, deliver and utilise oxygen (or whole-body fatigue).

9f.

Marks	0	1	2	Average
%	26	42	31	**1.1**

Advantages: direct measure of VO_2, not a prediction, allows precise measurement; other variables such as max. HR, LIP, heart rate zones can be established; easier to control environmental variables.
Disadvantages: costly equipment/venue/test administrator to conduct test; limited testing venues (access to facilities); need a trained professional to administer the test; can only test one person at a time.

Question 10
Students handled this question well, demonstrating a good understanding of psychological strategies that can enhance performance.

10a.–b.

Marks	0	1	2	3	4	5	Average
%	5	7	15	22	28	24	**3.4**

10a.
Suitable answers included (three of):

- decrease anxiety
- increase motivation
- deal with pain or injury
- control arousal levels
- increase self-confidence/self-esteem
- increase self-efficacy
- increase concentration and focus
- coping strategy
- maintaining and practising existing skills
- reviewing past performances and identifying technique problems (fewer errors)
- improve neural pathways between brain and muscles
- reduce the risk of choking
- improve decision-making.

10b.
A description of how one of the following might improve an athlete's performance was required for full marks.

- sleep
- meditation

- breathing control
- centring
- simulation
- progressive muscle relaxation
- motivational techniques
- positive self-talk
- goal-setting
- optimal arousal
- concentration techniques (stress inoculation)

The following is an example of a high-scoring response.

Stress Inoculation Training: Performing a task under pressure to help the athlete cope when they are in a game situation to help reduce the risk of choking.

Question 11
Parts a. and b. were done well, but few students could explain why the rider would be working above their LIP in part c. While students could define excess post-exercise oxygen consumption (EPOC) in part d., few could explain what occurs physiologically.

11a.–b.

Marks	0	1	2	Average
%	16	39	45	**1.3**

11a.
Aerobic energy system

11b.
Accumulation of metabolic by-products

11c.

Marks	0	1	2	Average
%	41	42	17	**0.8**

In order to keep up a fast pace, the rider at the front will have to increase their intensity, resulting in an increased contribution from the anaerobic systems to maintain the intensity. There would not be enough oxygen present to supply the majority of the fuel needed for energy aerobically.

11d.

Marks	0	1	2	3	Average
%	42	36	17	6	**0.9**

In recovery, oxygen (EPOC) is used in the processes that restore the body to a resting state and adapt it to the exercise just performed. Post-exercise oxygen consumption replenishes the phosphagen system and oxidises metabolic by-products. EPOC fuels the body's increased metabolism from the increase in body temperature that occurs during exercise.

Question 12
Part a. was very well done by most students. Students were awarded marks for part b. if they correctly applied the old National Physical Activity Guidelines (NPAG) or the new Physical Activity and Sedentary Behaviour Guidelines.

12a.–c.

Marks	0	1	2	3	4	Average
%	4	30	38	21	6	**2**

12a.
Suitable examples included: sitting at work, sitting in a meeting, sitting at a desk/computer.

12b.
In relation to the **old** National Physical Activity Guidelines:
Person 2 demonstrates a better profile, irrespective of total sedentary time (8 hours 30 minutes) and total activity time (3 hours 30 minutes) being equal as they have the shortest 'longest sedentary time'. Person 2's profile demonstrates implementation of the following guidelines:

- be active every day as many ways as you can
- thinking about movement as an opportunity.

In relation to the **new** Australia's Physical Activity and Sedentary Behaviour Guidelines:
Person 2 demonstrates a better profile irrespective of total sedentary time (8 hours 30 minutes) and total activity time (3 hours 30 minutes) being equal as they have the shortest 'longest sedentary time'. Person 2's profile demonstrates implementation of the following guidelines:

- minimise the amount of time spent in prolonged sitting
- break up long periods of sitting as often as possible.

12c.
You can be physically active, meet the National Physical Activity Guidelines and still be highly sedentary and/or sedentary behaviour is independently associated with poor health effects.

Question 13
Students awarded full marks for this question were able to correctly identify isotonic drinks as the drinks most likely to enhance performance **during** team sports and explain why. Students were awarded partial marks for explaining the benefits of hypertonic or hypotonic drinks to team sport performance in part b.

13a.–b.

Marks	0	1	2	3	Average
%	29	19	22	30	**1.5**

13a.
Isotonic

13b.
Isotonic drinks

- enhance hydration to help prevent dehydration and rises in core temperature and blood flow to the skin
- provide a supply of energy to the body to prevent glycogen depletion
- replace lost salts to maintain cell fluid balance of electrolytes

Hypertonic drinks

- will maintain blood glucose levels if consumed with water/isotonic drinks to prevent dehydration and replace lost electrolytes

Hypotonic drinks

- fluids are absorbed rapidly to maintain hydration and replace lost electrolytes

Question 14
Energy system interplay continues to challenge students. Many students provided generic commentary on the interplay of the three systems without specific reference to volleyball or to the nature of a team sport. Students who listed characteristics of the three systems without a discussion of the intensity and duration of the movements used in volleyball did not receive full marks. Students are reminded that responses must address the stem of the question. In part b., students were required to provide guidelines specific to plyometric training and not training principles.

14a.

Marks	0	1	2	3	4	5	6	Average
%	8	15	25	24	17	9	3	**2.7**

The following is an example of a high-scoring response.

All three energy systems would contribute to the energy requirements of the player during the game. Depending on the intensity and duration of the activity, their contribution will vary throughout the game. During plays that are high intensity, explosive and short duration such as blocking or spiking the ATP-CP system would be used predominately. The aerobic system is used during periods of low intensity when the demand for ATP is not as high (such as between points) and is used to replenish the ATP-CP system. The anaerobic glycolysis system is used for repeated efforts such as longer points, extended rally's or when a player continuously blocks and spikes at the front of court where the ATP-CP system would become exhausted as there may not be enough time to replenish CP stores. Due to the length of the contest (30-60 minutes) the aerobic energy system would be used predominately.

14b.

Marks	0	1	2	Average
%	66	26	8	**0.4**

Suitable answers included:

- as a precaution it is highly recommended that athletes have a substantial strength training base before starting a plyometric training program
- progress exercises from a low intensity to a high intensity
- practise the skill of the exercise
- when fatigue interferes with technique, cease the exercise
- jumps should be limited in height
- ensure no pre-existing injuries
- warm-up/stretch before undertaking plyometric training
- work muscle groups alternatively
- follow safety precautions – appropriate footwear, supervision.

Question 15

Students did not perform well on this question. A superficial level of understanding of the key knowledge was evident. Students and teachers should refer to the supplement 'Unit 3: Social-ecological model and physical activity' on the Physical Education curriculum page of the VCAA website for further clarification of content.

15a.

Marks	0	1	2	3	4	Average
%	40	18	27	7	9	**1.3**

Physical environment factors

- aesthetics or perceived qualities of the facility and surrounds – clean, trees rather than concrete, welcoming
- safety – lights, speed of traffic around entrance/building, security/support
- access/connected – accessible via appropriate paths, situated within community, public transport/active transport encouraged

Policy-level factors

- urban planning – the state government planned that the facility be accessible in the community by ensuring adequate walking and bicycle tracks
- transport – local government has developed strategies to make transport options to the facility accessible; for example, bus routes stop in the car park, front of the facility and active transport policies
- access, funding policies – local community groups/schools can use the facility at a subsidised rate

15b.

Marks	0	1	2	3	4	Average
%	30	30	26	10	4	**1.3**

Changes to the physical environment have the potential to change an individual's behaviour. Changes to the physical environment that promote aesthetic appeal, access and safety allow for individual- and social-level initiatives to be implemented. Initiatives that encourage changes to behaviour, such as media campaigns that encourage people to walk, will be ineffective in communities where there are no or poorly maintained walking paths or where safety is an issue. Therefore, individual- or social-level programs are more likely to be effective when preceded by programs for the development of community facilities that are aesthetically pleasing and/or accessible and/or safe.

Question 16

Marks	0	1	2	3	Average
%	15	44	30	10	**1.4**

Students were generally able to identify one aspect of the WADA rationale; however, to gain full marks students needed to be able to explain why this would result in growth hormone (GH) being banned. Students could receive full marks for any one of the three WADA criteria.

Suitable answers included the following.

- Growth hormone violates the spirit of sport as it gives an unfair advantage to some athletes over other athletes not using or not having access to the substance, therefore decreasing fair play and producing an uneven playing field.
- GH can enhance performance as it increases IGF-1 production and amino acid uptake to increase protein synthesis and muscle mass, giving an advantage to athletes requiring power, speed and strength for successful performance.
- GH can damage an athlete's health as it can promote insulin resistance, type 2 diabetes, cardiac deficiency, abnormal growth of bodily organs, water retention, carpal tunnel syndrome, hypertension, osteoarthritis, joint and bone pain, and worsened cardiovascular disease, putting the athlete at a higher risk of harm over athletes not using the substance.

Question 17

Students demonstrated a reasonable understanding of the relationship between heart rate, stroke volume and cardiac output. Full marks were awarded to students who referred to the formula and data as stipulated in the question.

17a.

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

$Q = SV \times HR$

Cardiac output at rest is unchanged as the average adult needs the same amount of blood pumped around the body. As the trained athlete has a greater stroke volume, their heart does not have to beat as often to supply the body with the same amount of oxygen.

17b.

Marks	0	1	2	3	Average
%	26	33	29	13	**1.3**

As the marathon is an aerobic sport, the person with the greater aerobic capacity will perform better. In the table given in the question, the trained athlete had a stroke volume of 170 mL compared to 110 mL for the untrained runner. This means at maximum, the trained athlete is able to supply the muscles with more oxygen (up to 12 L/min more). Therefore, the trained athlete can work at a higher intensity while still working aerobically.