2011 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2011 Physical Education GA 3: Examination

GENERAL COMMENTS

The 2011 Physical Education exam allowed students to demonstrate their knowledge of key concepts through a variety of applications, including graphical analysis and interpretation of data. Students were rewarded for the use of correct terminology in their responses and careful consideration of the question asked. Students who were able to use the information and data provided in the stem of the question and relate their answer to the given scenario generally received full marks, as opposed to students who gave generic answers that did not fully address the question. There continues to be strong evidence that students who do not participate in practical activities are disadvantaged in their written examination. Students are required to conduct an activity analysis, participate in fitness testing, and design, participate in and evaluate a training program.

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

- 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 make their response specific to the question asked.
- Students who used correct terminology when answering questions were more likely to receive full marks.
- Rewriting information provided in the stem of the question is only beneficial if it is information or data that supports a student response.
- Students who had participated in practical classes that support the theoretical content of Physical Education demonstrated a more comprehensive understanding of activity analysis, fitness testing, training principles and methodology.
- The use of data needed to be appropriate and suitable to support or justify the student response. Students needed to analyse the data provided and give a suitable example to support their response. Simply listing data from that provided was not sufficient to receive marks.
- Students needed to read the questions carefully and ensure that they were using all of the provided information in their responses.
- Students continue to have a poor understanding of the relationship between lactate inflection point (LIP) and lactate tolerance, and the impact of training on these two variables. 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.
- Student handwriting continues to be a problem. Responses need to be legible to ensure assessors can read student responses and award marks as appropriate.

SPECIFIC INFORMATION

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

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.

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	6	3	3	88	
2	3	1	69	26	
3	7	8	74	10	
4	84	14	0	1	
5	19	58	19	5	Students needed to identify the most suitable method for developing balance and core strength. Pilates was the most suitable method for developing these fitness components.
6	11	66	9	14	
7	2	84	6	8	

Question	% A	% B	% C	% D	Comments
8	29	14	15	41	Students found this question quite challenging. They needed to understand the use of the term 'load' when looking at different types of exercises, keeping in mind the resistance and flexibility of the exercises. In the up phase of the leg extension using a Cybex machine, the load changes as the exercise progresses.
9	1	81	8	10	
10	78	7	13	2	
11	63	3	15	19	
12	77	10	9	4	
13	6	8	79	7	
14	25	3	7	65	
15	64	12	11	13	

Students handled the multiple-choice section of the paper very 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

Question 1a.

Marks	0	1	2	Average
%	42	11	46	**1.1**

- CO_2
- H_2O
- heat

Students who could correctly determine from the graph that line A was the aerobic energy system were able to correctly identify two by-products of this process.

1bi.

Marks	0	1	2	Average
%	14	6	80	**1.7**

1bii.

Marks	0	1	2	3	4	Average
%	10	8	15	21	45	**2.9**

Question 1bi. was done very well by students. They were expected to use the graph and the information provided in the table to determine the duration and fuel source of the two anaerobic energy systems in Question 1bii. The graph shows that the ATP-CP system is exhausted at 25 seconds and the anaerobic glycolysis system at 205 seconds; however, students were not penalised for giving a duration within that range that would be an acceptable duration of the systems during activity. It is important to note that ATP is not a fuel, and students who wrote ATP-PC were not awarded marks.

Anaerobic energy pathway	Intensity	Duration	Fuel
C	Maximal >95%	0–25 sec	PC
B	Maximal >85%	0–205 sec	glucose, CHO, glycogen

Question 2

This question was reasonably well done by students. To receive full marks it was imperative that students made the link between the strategy they selected and the physiological process that the strategy used to delay fuel depletion. Many students incorrectly identified glycogen sparing as a strategy to delay fuel depletion. The strategy is training and the physiological response to training is glycogen sparing.

2a.

Marks	0	1	2	3	Average
%	16	16	37	31	**1.9**

Factors that affect the rate of fuel depletion during exercise include (three of):

- exercise duration
- exercise intensity
- type of contraction (dynamic/isometric)
- training status
- nutritional status
- environmental conditions (heat, altitude)
- type of exercise/activity (task dependent)
- hydration.

2b.

Marks	0	1	2	3	4	Average
%	15	10	31	16	28	**2.3**

- Glucose ingestion/carbohydration – maintain fuel supply and decrease perception of exertion.
- Carbohydrate loading – increase and maintenance of muscle glycogen during prolonged exercise.
- Whole body pre-cooling – decrease core temperature during exercise in heat.
- Endurance training – increased mitochondria and triglyceride stores leads to increased fat oxidation and therefore decreased glycogen depletion.
- Anaerobic training – increased muscle ATP, CP and glycogen stores.
- Hydrating – by remaining hydrated the athlete will not have to work as hard and therefore fuel levels will not be depleted as quickly.
- Creatine supplements – increases initial CP stores in the muscle.
- Caffeine supplements – delays the use of glycogen by increasing the mobilisation fats stores earlier.

Question 3

In 3ai. students were able to identify subject B as the cross country skier; however, in 3aii. some had difficulty justifying their response with more than the fact that subject B had the highest test results. For full marks, students needed to discuss the aerobic nature of cross-country skiing, chronic adaptations to the cardiovascular system and provide data from the table to demonstrate this.

3ai.

Marks	0	1	Average
%	16	84	**0.9**

Subject B is the most likely to be the elite male cross-country skier.

3aii.

Marks	0	1	2	3	Average
%	23	26	35	16	**1.5**

An aerobically fit athlete such as an elite cross-country skier will have higher values for these indicators. As can be seen in the data, the cross-country skier has a RBC count of 5.9, a haemoglobin count of 18.5 and a haematocrit of 54. Because cross-country skiers train at altitude they would have the highest RBC count, haematocrit and haemoglobin count, increasing the oxygen-carrying capacity of the blood and the ability of the athlete to produce ATP aerobically.

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

> *Cross country skiing is an endurance event and requires a well developed aerobic capacity and ability to uptake transport and utilise oxygen efficiently. By having the highest number of haemoglobin, red blood cells and haematocrit, it suggests this athlete has the highest capacity to transport oxygen and thus can more efficiently resynthesise ATP aerobically. This will aid in being able to continue to use and sustain intensity throughout exercise aerobically.*

3b.

Marks	0	1	2	3	Average
%	31	22	40	7	**1.3**

Erythropoietin (EPO) is a naturally occurring hormone that can be synthetically produced to stimulate the production of red blood cells. This increases the oxygen-carrying capacity of the blood, allowing the athlete to deliver more oxygen to be used by the working muscles, thus increasing aerobic capacity.

A common error made was to confuse EPO with blood doping. Students had difficulty linking the physiological effect of EPO to enhanced performance.

3c.

Marks	0	1	2	3	Average
%	50	15	22	14	**1**

A potential harm associated with EPO is increased blood viscosity due to increased red blood cells. At night when resting heart rate drops, the blood can clot and this can cause heart failure, stroke and death. The cyclists are exercising at night to avoid this by increasing their heart rate and blood circulation, which decreases the chance of blood clotting.

This question proved to be very difficult for students, with many not knowing the potential harm of using EPO. They were then unable to provide a strategy to alleviate the problem.

3d.

Marks	0	1	2	Average
%	74	19	7	**0.4**

WADA was established in 1999, and many sports have become WADA-compliant and banned EPO. More testing is being carried out, and there are more reliable tests for EPO detection. Athletes are subjected to no-advanced-notice sample collection and need to complete information on athlete whereabouts.

Students were expected to identify the establishment of WADA and the consequent improvement in testing procedure. Many students incorrectly answered this question from an ethical perspective. By misinterpreting the question many students focused on why more athletes are using EPO rather than why more are being caught.

3e.

Marks	0	1	2	Average
%	47	32	21	**0.8**

The athlete will sleep in a hypoxic tent and then train in an oxygen-rich environment. The body will adapt by making more red blood cells, increasing the athlete's oxygen-carrying capacity while still allowing for quality training sessions.

A common error was to confuse hypoxic tents with hyperbaric chambers and then confuse the use of low oxygen environments to high oxygen environments.

Question 4

Students demonstrated an understanding of the social-ecological model in 4a. Policy continues to trouble many students, however, and it must be made clear to students that a policy cannot involve forcing workers to participate in physical activity. Students receiving full marks linked the example to the success of the CycleSmart initiative. It was apparent in 4b. that the majority of students had only a superficial understanding of this model. These students were unable to discuss the relationship between the multiple levels and the impact this has on the success of an initiative such as CycleSmart.

4a.

Marks	0	1	2	3	4	5	6	Average
%	9	3	7	11	18	28	25	**4.1**

- **Social environment** – social support from friends/work colleagues, etc. may influence an individual's decision to participate in the program. If they have someone to ride with they may be more likely to participate.
- **Physical environment** – bike racks/showers/change facilities. If these facilities are available at the destination then an individual may be more likely to be involved.
- **Policy** – Incentives for employees participating in the program such as flexible work hours for those who cycle to and from work may encourage people to be involved in the initiative.

4b.

Marks	0	1	2	3	Average
%	39	28	21	13	**1.1**

The multiple levels of influence interact with each other and no single factor will lead to a change in an individual's behaviour. An initiative that targets all four levels of influence is more likely to change a person's behaviour. The individual may have the required skills and fitness to ride to work, but without the support of his/her spouse/peers/work colleagues, access to a bike and other cycling accessories, and a flexible starting time for work they may not make a change to their behaviour.

Question 5

Most students were able to identify the cause of fatigue, but very few were able to explain why this then causes the body to slow down. Students' ability to apply their knowledge was lacking, and very few could explain what occurs when the body dehydrates and how this affects performance. Many students restated the facts given in the question stem. Other students listed facts about each method of hydration in 5c. rather than demonstrating what was similar and different between the two methods.

5a.

Marks	0	1	Average
%	20	80	**0.8**

Dehydration or elevated body temperature

5b.

Marks	0	1	2	3	Average
%	42	27	17	15	**1.1**

Bruno has an increased core body temperature, which leads to increased sweating. To cool the core, blood is redirected away from the muscles where it is needed for aerobic metabolism and is sent to the skin instead to cool the body. This reduces the oxygen supply to the muscles and therefore the amount of aerobic metabolism, resulting in Bruno having to slow down.

5c.

Marks	0	1	2	3	4	Average
%	13	29	32	19	7	**1.8**

- Both IV hydration and drinking water will hydrate the body, possibly at the same rate.
- There is no difference in performance after IV hydration compared to drinking water.
- IV is the administration of fluid (usually saline solution and glucose) via a needle into a vein, whereas oral hydration is via the mouth (drinking).
- IV hydration is useful for people who are unconscious or unable to drink water themselves.

- IV hydration is invasive and requires a medically trained person to administer, whereas water can be taken orally without assistance and is readily available.
- An athlete is immobilised while being hydrated intravenously, while drinking water an athlete can move around (during exercise or active recovery).
- IV hydration is time consuming, whereas drinking water is not.
- IV hydration has associated risks of needlestick communicable diseases and oral hydration has the risk of transferring disease through saliva and the sharing of drink bottles.
- IV hydration can contravene WADA code in circumstances other than medical, whereas oral hydration is not banned.

Question 6

An understanding of fitness components and the factors that affect them are key concepts. Many students were unable to define each component and could not provide an example of a fitness test and training method, indicating that they had not participated in fitness testing or training. Students who did not read the question properly reused weight/resistance training as an answer and were not awarded any marks. While some students were able to identify a factor that affected strength few could then explain how.

6a.

Marks	0	1	2	3	4	5	6	Average
%	9	11	14	17	19	17	12	**3.3**

Component of fitness	Definition	Example of a recognised fitness test	Specific training Method
Muscular power	Is the combination of speed and strength and is the ability to exert a force rapidly/explosively	• standing long jump • standing vertical jump • seated basketball throw • baseball throw for distance	• plyometrics • circuit training
Muscular strength	(Maximal) force that can be generated by a muscle or muscle group (in one maximal effort)	1 RM bench press	weight/resistance training
Muscular endurance (local)	Ability of a muscle or muscle group to perform repeated muscle contractions	• timed sit-up/ push up • maximum pull ups • flexed arm hand test • timed wall sit	• circuit training • Fartlek training • continuous training • long interval training

6b.

Marks	0	1	2	3	4	Average
%	31	9	22	12	25	**1.9**

Factors affecting the strength of a muscle include (two of with an explanation):

- fibre type – characteristics of fast twitch fibres allow for stronger contractions than slow twitch fibres
- age – strength will increase until 25–30 years of age and then plateau before declining as age increases
- gender – males are generally stronger than females due to the increased levels of testosterone and greater cross-sectional area of the muscle
- type of contraction – the type of contraction will determine the force developed by the muscle
- length tension relationship – peak force is generated at muscle lengths slightly longer than resting lengths

- speed of contraction
- muscle size – greater cross-sectional area, greater strength
- fibre arrangement – pennate muscles are designed for strength, fusiform muscles are designed for speed.

Question 7

Many students found this question challenging. It was a question that rewarded students who had performed an activity analysis, participated in fitness testing, designed a training program and able to transfer the knowledge gained through these experiences.

7a.

Marks	0	1	2	Average
%	11	54	35	**1.3**

Two of:

- anticipation/anxiety/nerves before the race
- they may have performed a light warm-up prior to the race
- when standing, blood has to pump against gravity.

7bi.

Marks	0	1	2	Average
%	40	42	18	**0.8**

Data that could be collected as part of an activity analysis on a triathlon include (two of):

- heart rates/intensity charts
- movement patterns
- distances travelled
- skill frequency
- GPS data, including speed and acceleration.

7bii.

Marks	0	1	2	3	4	Average
%	53	18	18	6	5	**0.9**

The data can be used to determine the relevant W:R, muscle groups, fitness components, intensity levels and energy systems so that training can be designed to be specific to the requirements of the sport.

Students needed to link the data identified in part i. to the information it provided about the specific requirements of a triathlon and design the training program to answer this part of the question.

7c.

Marks	0	1	2	Average
%	32	56	12	**0.8**

Both the 19-year-old and the Year 10 students must have the requirements of the test explained, an explanation of potential risks, an assurance of confidentiality and the opportunity to ask questions. The Year 10 students will require parental consent; however, the 19-year-old is over 18 and can give their own consent.

Question 8

Students must read the labels provided on graphs to ensure they correctly identify the trends shown by the graph. In this question, movement counts were recorded in terms of their intensity. Many students assumed the *x*-axis was time and described how physical activity increased from sedentary to vigorous over the course of lunchtime. Students needed to use data to support their answer to receive full marks. In Question 8c. students demonstrated a thorough knowledge of population-based programs for primary-aged students.

8a.

Marks	0	1	2	3	Average
%	8	20	34	38	**2**

Boy 1 spent relatively little time engaging in sedentary (approximately 5 movement counts) or light (approximately 35 movement counts) intensity activity. He spent a small amount of time performing moderate (approximately 70

movement counts) physical activity and a majority of time engaged in vigorous (approximately 245 movement counts) intensity activity.

8b.

Marks	0	1	2	Average
%	25	51	23	**1**

Possible answers included (but were not limited to):

- boy 1 has a greater number of play spaces (ovals, open spaces, courts, etc.) available compared to boy 2
- boy 1 has more play equipment (playgrounds, sporting equipment, etc.) available compared to boy 2
- boy 1 has play areas that were covered; boy 2 had no covered play spaces.

8c.

Marks	0	1	2	Average
%	23	10	67	**1.5**

Suitable answers included:

- walking school bus
- Jump Rope for Heart
- mandated PE/sport in schools
- Go For Your Life programs
- active after school communities
- modified sports
- ride to school.

Question 9

Overall, this question was handled well by the majority of students. Common errors were to list tidal volume and respiratory rate as factors. Student explanations of the relationship between cardiac output and oxygen uptake often did not include explanation of the role of heart rate and stroke volume.

9a.

Marks	0	1	2	Average
%	17	16	68	**1.5**

- stroke volume
- heart rate

9b.

Marks	0	1	2	3	Average
%	32	22	21	26	**1.4**

There is a linear relationship between cardiac output and oxygen uptake. Due to the increased amount of blood pumped out of the heart with each beat (increased SV) and the increased number of beats per minute due to the increased HR, as one increases so does the other.

Question 10

Marks	0	1	2	3	4	5	6	7	Average
%	5	5	9	13	18	19	18	13	**4.3**

Students were able to receive some marks by identifying advantages and limitations of each method of measurement, but many discussed availability and cost. Students who received full marks were able to identify relevant advantages and disadvantages to the Year 1 age group and correctly determine from their analysis that the accelerometer was the best choice for this age group.

A suitable answer would include some of the following points: A pedometer is small, lightweight and non-invasive. It provides immediate feedback, can act as a behavioural change tool, it is easy to use with large groups; however, it only measures steps. Intensity, frequency and duration cannot be measured, it cannot record and store data in real time, estimates of energy expenditure are inaccurate for children, it cannot measure sedentary behaviour and is not suitable for water-based, cycling or non-walking activities.

Accelerometers are also small, lightweight, non-invasive and have a low subject burden, can be used in the lab or the field, assess intensity, frequency and duration of physical activity (PA), record movement in real time and can assess PA that is difficult to capture, which is good for children. They are not good for water-based activities, they don't record type of activity, they underestimate low-intensity activities, energy expenditure equations are less accurate for children, subjects forget to wear them at times and they can be reactive.

Five-day PA recall questionnaires do not alter PA behaviours, assess PA across all domains, measure frequency, intensity, duration, type and context, energy expenditure can be estimated and can capture qualitative and quantitative data. However, they are not suitable for children because of recall limitations for children 10 years and under, which affects their reliability and validity.

Overall, the best choice for the assessment of this group would be the accelerometer.

Question 11

Question 11 was challenging for many students. In Question 11a. students had difficulty identifying three different fitness components and often received only two of the three marks. In Question 11bii. students were unable to explain what occurs to allow for increased pulmonary diffusion and were then unable to link chronic adaptations of the cardiovascular and muscular systems to the increased oxygen that is available due to the increased pulmonary diffusion.

In 11c. students tended to write everything they knew about energy systems and interplay without answering the question. The relevant information about energy system interplay needed to be used to explain why the split times in the 400 m event are longer than the 100 m time.

Lactate tolerance and the lactate inflection point (LIP) continue to trouble students. Most thought that training at or above LIP would increase the LIP. Students needed to identify from the data that the athlete would be working above LIP and therefore producing lactate at a faster rate than it could be removed. The body learns to tolerate the increased levels of lactate, allowing the athlete to continue to generate ATP anaerobically, which is at a faster rate and allows them to swim at a higher intensity. Training methods that increase LIP (aerobic training) and training to increase lactate tolerance (anaerobic) were poorly understood by many students.

11a.

Marks	0	1	2	3	Average
%	16	22	23	40	**1.9**

- 50-metre freestyle – anaerobic capacity
- 800-metre freestyle – muscular endurance (local) or aerobic capacity
- 1500-metre freestyle – aerobic capacity or muscular endurance (local)

11bi.

Marks	0	1	Average
%	78	22	**0.2**

An increase in pulmonary diffusion means that more oxygen can diffuse from the alveoli into the blood in the same period of time due to the increase in surface area of the alveoli.

11bii.

Marks	0	1	2	3	4	Average
%	31	12	23	9	26	**1.9**

Suitable answers included:

- an increase in RBC, haemoglobin, stroke volume or cardiac output enables the increase in oxygen to be transported to the muscle.
- an increase in mitochondria, myoglobin, a-vO_2 or oxidative enzymes can utilise this increase in oxygen to create more ATP aerobically.

11c.

Marks	0	1	2	3	4	Average
%	36	21	23	14	6	**1.4**

Although the ATP-CP and aerobic systems contribute, the predominant energy system for the 100-metre swim is anaerobic glycolysis as it takes 46.91 seconds compared to the 400-metre swim, which takes 3.40 minutes, meaning that the predominant energy system for this event is the aerobic system. The aerobic system produces ATP at a slower rate than anaerobic glycolysis and therefore the times for each 100-metre split will be slower.

11d.

Marks	0	1	2	3	4	Average
%	37	16	23	13	12	**1.5**

The 1500-metre freestyler predominantly uses the aerobic system so their W:R would be 1:1 or below, whereas the 50-metre freestyler predominantly uses the ATP-CP system and therefore their W:R would be 1:3–1:6.

The swimmers would also train over different distances. The 1500-metre swimmer uses longer intervals 400–1000 metres, whereas the 50-metre swimmer would use shorter intervals 25–100 metres.

The 50-metre swimmer would train at a higher intensity (above 85% HR max.) and the 1500-metre swimmer would train at a submaximal intensity (70–85% HR max.).

The 50-metre athlete is most likely to undertake a passive recovery, whereas the 1500-metre swimmer is likely to undertake an active recovery.

11e.

Marks	0	1	2	3	4	Average
%	57	24	12	5	2	**0.7**

At this intensity, the swimmer is training above their lactate inflection point (LIP) and therefore cannot clear the lactate at the same rate in which it is being produced. Lactate accumulates but the training increases lactate tolerance due to increased buffering capacity. The swimmer is able to work at a high intensity (anaerobically) for longer and produce ATP at a faster rate, and so swim faster (improve performance), producing high blood lactate levels at the end of the race.