VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2010 Physical Education GA 3: Written examination

GENERAL COMMENTS

The 2010 Physical Education examination proved to be challenging for many students. The examination required students to demonstrate their understanding of both the key knowledge and key skills as stipulated in the *VCE Physical Education Study Design*; however, it was in the application of this knowledge that students had difficulty. Students who had not undertaken an activity analysis, participated in fitness testing and undertaken various forms of training were unable to make the connection between the theoretical knowledge they had gained and specific physical activity scenarios. With the implementation of the new study design in 2011, it is imperative that students participate in physical activity to be able to successfully complete the Physical Education examination.

In Section B, the following advice may assist teachers and students in preparing for the examination.

- Students who used correct terminology when answering questions were more likely to receive full marks.
- 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.
- Students need to be familiar with the key words in question stems; for example, compare and contrast, analyse, identify, evaluate and describe. Understanding these terms allowed students to gain full marks and to answer the question by doing what was required.
- Answers needed to be specific to the scenario provided. Students who were able to focus their response to the provided scenarios and who gave the relevant information were awarded full marks.
- Students needed to read the questions carefully to ensure that they were using all of the information provided in their response.
- Lactate Inflection Point (LIP) was poorly understood by students and greater emphasis needs to be on the relationship between aerobic training and LIP.
- Students are reminded to write legibly so assessors can read their responses.

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	12	17	17	54	
2	9	23	64	4	
3	9	75	4	12	
4	5	38	21	36	Lactate Inflection Point (LIP) was poorly understood by students and many thought that an increase in LIP was due to an increased ability to tolerate lactate. However, an increase in LIP is due to an increased ability of the body to break down and remove lactate.
5	41	30	19	9	A common error was to suggest that the soleus was involved in hip flexion. Students needed to identify the muscles involved in the flexion and extension of the hip. The two muscles that cross the hip joint are the iliopsoas and gluteals (option A).
6	35	9	23	33	PNF stretching (Diagram 2) is the most effective method of developing flexibility. However, like any training, flexibility training should be specific to the sport or activity being undertaken. Therefore for an athlete involved in explosive, power-based activities, dynamic stretching (Diagram 3) may provide greater improvements in flexibility than static stretching (Diagram 1). Depending on the athlete and the situation, both options A and D were considered correct responses.

Question	% A	% B	% C	% D	Comments
7	8	12	62	17	
8	9	3	19	69	
9	72	6	14	7	
10	89	2	4	4	
11	1	2	85	12	
12	38	25	33	4	Economy is characterised by a decrease in the amount of energy needed to run at a given speed, so the correct answer was option C. Some students did not read the question carefully and linked the endurance training in the question stem to an increase in VO_2 max.
13	7	50	23	21	The breakdown of carbohydrates as a fuel for energy production is a key concept in physical education. Students should be able to identify the by-products (water and carbon dioxide) associated with the breakdown of carbohydrate in the presence of oxygen (oxidation) and identify that energy (ATP) would also be present, as given in option B.
14	1	13	2	84	
15	11	11	17	61	

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

Section B – Short answer questions

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

Question 1

Students performed well on this question, with the majority being able to identify the food fuel utilised from the graph. In Question 1b., students were generally able to state that carbohydrates are the body's preferred fuel for submaximal activity; however, few understood that fats require carbohydrates to be completely oxidised.

1a.

Marks	0	1	2	Average
%	17	15	68	**1.5**

1ai.

Carbohydrates/glucose

1aii.

Fat/lipids/triglycerides

1b.

Marks	0	1	2	Average
%	56	33	11	**0.6**

Carbohydrates are the body's preferred fuel for sub-maximal activity and are required for fats to be completely oxidised. However, fat requires more oxygen to break down.

Question 2

Both parts of this question were completed well by students. In 2a., students were not awarded marks for giving strategies that did not specifically link to the identified perceived barrier. For example, if the barrier was 'it's too cold', then putting on warmer clothes was not an acceptable answer, but substituting alternatives to exercise indoors was specific and relevant and received full marks.

2a.

Marks	0	1	2	Average
%	10	33	57	**1.5**

Suitable answers included the following.

It's too cold	• enlisting social support • reward systems • goal setting, making a commitment • substituting alternatives
I'm too tired	• enlisting social support • reward systems • goal setting, making a commitment
I don't have time	• enlisting social support • reward systems • goal setting, making a commitment • use of reminder systems
I can't afford to go to the gym	• substituting alternatives • use of community resources such as walking tracks and bike paths
I find it hard to stay motivated	• enlisting social support • reward systems • goal setting, making a commitment • use of reminder systems • substituting alternatives

2b.

Marks	0	1	2	Average
%	15	31	54	**1.4**

Either of:

- an increase in self-efficacy leads to an increase in an individual's situational confidence, making them more likely to exercise when it is cold or wet, by themself or when they are tired
- an increase in self-efficacy is linked to movement through the stages of change and an ability to overcome common barriers.

Question 3

Marks	0	1	2	3	4	Average
%	40	19	19	13	8	**1.3**

This question was very poorly done by students. To receive full marks students needed to identify two aspects of both questionnaires and pedometers that are the same and two that are different. It was evident that students were unsure of what they needed to do and where the information needed to be placed. Students needed to ensure that they didn't restate the contrast that was given in the question stem (that questionnaires are subjective and pedometers are objective).

Comparison	Contrast
Questionnaires and pedometers are cheap methods for assessing physical activity levels.	Questionnaires are non-reactive, but pedometers are reactive.
Questionnaires and pedometers are easy to use and administer.	Questionnaires are not good for young children but pedometers can be used by young children.
Questionnaires and pedometers are good for large population-based studies.	Questionnaires measure patterns, modes and dimensions of physical activity; pedometers do not.
	Questionnaires are subject to social bias, while pedometers are not.

Question 4

Marks	0	1	2	3	4	Average
%	14	8	23	13	42	**2.6**

Suitable answers included:

- breath control, centering, use of breathing techniques to relax and refocus; for example, when rifle shooting
- use of motivational cue words/positive self-talk. Remaining calm and focused under pressure by maintaining an optimal level of arousal
- imagery, mental rehearsal, focusing thoughts and mentally rehearsing upcoming movements; for example, when rifle shooting
- acting and thinking positively, even when experiencing adverse competition conditions; for example, the snow conditions are not ideal during the race or the athlete misses a target. Positive images guard against performance deterioration.

Students who provided strategies that were specific to each discipline (cross-country skiing and rifle shooting) and explained how the strategy would lead to an improvement in performance were awarded full marks. It was important that the strategy was suitable and practical; mediation, for example, would not be performed during an Olympic event but controlled breathing would be performed. The question asked students for a strategy that could be used during the race.

Question 5

Students who had undertaken an activity analysis, fitness testing and had used the information in the development of a training program were able to successfully answer this question. While most could list one type of data that could be collected, few were able to explain how that data could then be used to find predominant energy systems, muscle groups and fitness components. In 5b., too many students described the test rather than providing a suitable exercise to develop power. Question 5c. was well done but in 5d., very few students understood the role the aerobic energy system plays in a predominately anaerobic team sport.

5ai.

Marks	0	1	2	Average
%	30	27	44	**1.2**

Two of:

- heart rates
- movement patterns
- skill frequency
- duration of work and rest periods (W:R)
- GPS data.

5aii.

Marks	0	1	2	3	4	Average
%	39	18	20	12	11	**1.2**

- Heart rates can be used to determine intensity, which can then be used to determine work:rest ratios and the predominant energy systems used in the sport. The training can be then be structured to develop the appropriate energy system.
- Skill frequency data can be used to determine the frequently used muscles and joint actions. This can then be used to determine the major muscle groups used in the sport so that training programs can be tailored to the improvement of these muscle groups.
- Movement patterns can be used to determine the type and distance of movements used in the sport. The data can be used to determine the muscle groups used and energy systems. This information can be used to determine the appropriate intensity and distance for training.

5b.

Marks	0	1	2	3	4	Average
%	28	29	25	11	8	**1.5**

Muscle group	Recognised test of power	Exercise
pectoralis major (upper body)	• seated basketball throw • softball throw for distance • medicine ball push/throw	• clap push ups • power press • medicine ball throw
quadriceps (leg)	• vertical jump • standing broad jump	• jump squats • depth jumps • skipping

5c.

Marks	0	1	Average
%	29	71	**0.7**

Weight/resistance training/plyometrics

5d.

Marks	0	1	2	3	4	Average
%	43	31	17	7	2	**1**

Continuous training develops a player's aerobic endurance, which is required for a game of volleyball because a volleyball game/match is longer than 20 minutes.

Volleyball requires repeated high intensity efforts with rest periods in between. The aerobic system is used to enhance the recovery during the rest periods to assist in the removal of inorganic phosphates and to replenish ATP stores in the muscle.

Increased aerobic endurance can improve player concentration and may reduce the chance of injury.

Question 6

Students needed to identify the characteristics of the energy systems used in both the 100-metre sprint and the 10-kilometre run in order to answer Question 6a. Marks were not awarded for simply identifying the energy system used in each event; more specific information on the differences between the two was required. In 6b., students needed to include the aspect of rest between sessions to receive full marks. In 6c., many students were able to identify that with endurance training, stroke volume increases. The question stated that the heart rate would be lower; however, very few students were able to discuss the relationship between these two parameters and cardiac output.

6a.

Marks	0	1	2	3	4	Average
%	42	16	20	11	12	**1.4**

The following differences were acceptable answers.

100-metre sprint	10-kilometre run
• depends on simple and short chemical reactions • most rapidly available source of energy	• involves complex chemical reactions via the Krebs cycle and electron transport system • slower to supply energy
• one chemical fuel only – CP • limited capacity – low yield	• two food fuels – carbohydrates rather than fats
• fuel only lasts approximately 10 seconds at maximal intensity	• can be used indefinitely • unlimited capacity – high yield
	• by-products of CO_2, H_2O and heat

6b.

Marks	0	1	2	Average
%	53	39	8	**0.6**

Three to four times per week for improvement or twice a week for maintenance with a rest day between sessions or muscle cycling on alternate days.

6c.

Marks	0	1	2	3	Average
%	43	27	20	10	**1**

The 10-kilometre runner's stroke volume (SV) is higher during exercise and rest. This means he/she can have a lower heart rate (HR) at rest to equal the given cardiac output (Q) because HR x SV = Q.

Question 7

Marks	0	1	2	3	4	5	6	Average
%	8	5	26	11	32	6	12	**3.2**

Suitable answers included:

- equal playing field – does the LZR suit create an unfair playing field?
- unfair advantage – does the suit give the athlete an unfair advantage?
- access – do all athletes have access to the technology?
- win at all costs – does the suit embrace the true spirit of the sport?
- better for spectators/sponsors – does it improve the sport?
- role models – does it show young swimmers that success comes from the suit and not from training?
- results are not based on human physiological potential, therefore they do not reflect the ability of the athlete
- world record holders – is it fair on current record holders to have their world records broken by an athlete wearing the suit?

This question was generally well answered by the majority of students.

Question 8

Students found this question particularly difficult, especially 8c., 8d. and 8e. Many students failed to read the information given in the stem of the question that athletes receive a 30-minute break between events in the decathlon, and then repeatedly stated that 'because the decathlete would be tired from their previous events …' they wouldn't perform as well as the elite athlete. Too many students discussed fibre type in 8d. and not the comparison of aerobic to anaerobic muscular adaptations. Responses to Question 8e. were the most concerning as a majority of students thought this question related to LIP.

8a.

Marks	0	1	2	Average
%	17	13	70	**1.6**

The 1500-metre run is the only aerobic event; all others are predominantly anaerobic.

8bi–ii.

Marks	0	1	2	3	4	Average
%	31	6	19	27	17	**1.9**

8bi.

400-metre sprint on day 1 and the 1500-metre run on day 2.

8bii.

Both races would require greater recovery than 30 minutes due to exhaustive use of the anaerobic glycolysis energy system.

8c.

Marks	0	1	2	3	4	Average
%	26	13	35	17	8	**1.7**

Due to the nature of the decathlon Roman Sebrie has to train many different fitness components, depending on the event. A person competing only in an individual event will concentrate on training predominantly in one area. For example, aerobic capacity requires continuous training for the 1500-metre run; muscular power and strength for shot put, javelin and discus require resistance training. A decathlete needs to find a balance between all fitness components, whereas a person competing in one event does not.

8d.

Marks	0	1	2	3	4	Average
%	49	17	14	10	9	**1.1**

The 1500-metre runner would predominately have aerobic adaptations and the decathlete would have would have greater anaerobic adaptations due to the different training undertaken. Suitable examples included Hicham El Guerrouj would have increased mitochondria levels, which allows increased aerobic production of ATP. Robert Baker would have increased muscle hypertrophy; increased muscle mass will be detrimental to a 1500-metre event.

8e.

Marks	0	1	2	3	4	Average
%	66	17	11	5	2	**0.6**

Elite 400-metre runners have greater amounts of lactic acid in their blood compared to decathlon 400-metre runners at the end of a 400-metre race, as an elite 400-metre runner trains to improve their ability to tolerate large levels of lactic acid in this system. They are then able to use their anaerobic glycolysis energy system for longer periods of time, increasing their ability to utilise anaerobic glycolysis under fatiguing by-products (buffering).

Question 9

Students needed to be able to recall the National Physical Activity Guidelines (NPAG) for adults to receive four marks in 9b. However, too many students provided the dimensions (frequency, intensity, time and type) of the Guidelines and consequently were not awarded marks. In 9c. students needed to ensure that the change to the environment or policy supported the employees in the walking group. Answers such as 'install bike racks' were not specific to the scenario of a lunchtime walking group and did not receive marks.

9a.

Marks	0	1	Average
%	19	81	**0.8**

One of:

- increased productivity
- decreased absenteeism
- increased workplace morale
- increased health and fitness
- increased adherence to the NPAG
- decreased staff turnover.

9bi.

Marks	0	1	2	3	4	Average
%	38	21	12	11	18	**1.5**

1. Think of movement as an opportunity, not an inconvenience.
2. Be active every day in as many ways as you can.
3. Put together at least 30 minutes of moderate-intensity physical activity on most, preferably all, days.
4. If you can, also enjoy some regular, vigorous activity for extra health and fitness.

9bii.

Marks	0	1	Average
%	44	56	**0.6**

- Rather than using a TV remote control, get up to change channels.
- Use the stairs rather than the lift.
- Park further away from your destination – active transport.
- Go for a walk at lunchtime or combine shorter sessions (10–15 minutes).
- Play a sport such as football or netball, go for a jog or do an exercise class.

9c.

Marks	0	1	2	3	4	Average
%	20	7	35	6	31	**2.2**

Two of:

- install showers – people can freshen up before returning to work
- provide facilities in which employees can change their clothing – areas where employees can change into suitable clothing to walk in
- casual clothing allowed in the office – employees will be more inclined to exercise if they are suitably dressed
- signage in the workplace promoting the health benefits of physical activity
- extended lunch break for those who participate – staff don't use all of their lunch time walking, so they still have time to sit and eat their lunch
- subsidised health insurance – financial incentive for increased health.

9d.

Marks	0	1	2	3	Average
%	34	25	20	21	**1.3**

Any of:

- a model such as the Stages of Change model could be used. The stages of motivational readiness of staff before and after the program need to be established. This could then be used to establish if there has been a change as a result of the program
- look at staff absentee data before and after the introduction of the walking group. Analysis of data to see if there has been any change in the number of days employees are absent
- questionnaires/surveys that look at health and wellbeing and/or physical activity levels before and after the introduction of the walking group, to see if there has been any change in employees' status in relation to the National Physical Activity Guidelines.

Question 10

Many students did not answer Question 10a. Students are reminded to read examination questions carefully and that when they see a graph on the examination paper there will usually be a question above or below it. Other students failed to read the axes and assumed that the *x*-axis showed time, not distance. Students were unable to demonstrate a good understanding of the concepts assessed in this question and many were unable to achieve full marks. In Question 10c., students who received full marks were able to discuss the change in fuel usage related to the change in intensity.

10a.

Marks	0	1	2	3	Average
%	42	37	1	20	**1**

A = 1200–1600 m
B = 800–1200 m
C = 0–800 m

10b.

Marks	0	1	2	3	Average
%	22	33	31	14	**1.4**

- Active recovery maintains elevated heart and respiratory rates, increased blood flow to muscles and venous return via the skeletal pump increases the rate of removal of the accumulated by-products.
- Lactic acid is a derivative of a glucose molecule. At a pace of 65 per cent of maximum heart rate or during submaximal exercise, limited anaerobic glycolysis is used. Lactic acid, if it is accumulated, is reconverted to pyruvic acid and used to create energy via aerobic glycolosis, removing the lactic acid faster than at rest.

10c.

Marks	0	1	2	3	Average
%	27	39	21	13	**1.2**

The aerobic energy system uses both fats and carbohydrates as a fuel source. However, the percentage to which each fuel is used depends on the intensity of the exercise. Higher intensities a greater percentage of carbohydrates is used because they produce a greater energy yield for the same amount of oxygen molecules.

10d.

Marks	0	1	2	Average
%	33	35	32	**1**

A physiotherapist may use any of the following techniques:

- stretching (static and/or proprioceptive neuromuscular facilitation [PNF]) – stretching a muscle against a resistance
- ultrasound – sound waves used to repair microscopic tears in a muscle
- heat/ice packs – reduce swelling or increase blood flow to an area prior to treatment
- hydrotherapy – water-based, non-weight-bearing exercise to increase blood flow to injured area
- taping – heel lock to restrict the range of motion of the Achilles tendon
- hot/cold contrast therapy – changing between hot and cold baths/showers
- hyperbaric chambers – increase blood flow to the injured area to increase recovery
- TENS – increase blood flow and pain relief.

10e.

Marks	0	1	2	Average
%	24	50	26	**1**

Two of:

- running in water
- running on soft surfaces (grass)
- heel-raise inserts (in shoes)
- taping/braces/thermowraps
- correct warm-up
- start running at a low to moderate intensity
- not running up hills.

Question 11

Students handled this question well.

11a.

Marks	0	1	2	3	4	Average
%	5	6	30	12	46	**2.9**

- Local muscular endurance: Ability to hold this position for long periods of time and/or repeated muscular contractions of the same muscle groups. To hold the position while looking for the next hand or foot position.
- Flexibility: Greater range of motion around a joint enables the rock climber to find holds for feet and arms that are well spread and to arch back.
- Muscular strength: Needed to hold body weight without losing the hold.

11b.

Marks	0	1	2	Average
%	12	34	54	**1.4**

Two of:

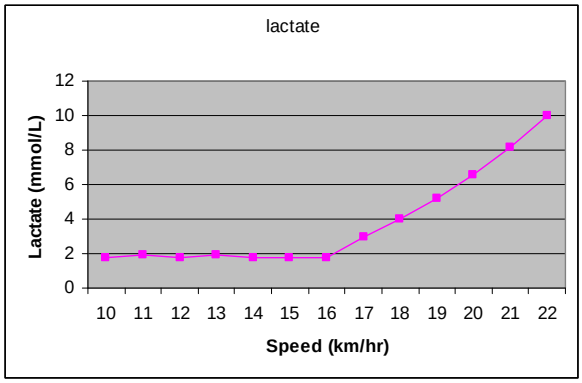
- instructional sessions: whether students are experienced or not, take them through an instructional session on safety and the use of climbing equipment
- equipment audit: conduct a regular equipment audit, checking safety of equipment; for example, rope strain
- correct footwear: most centres issue their own rock climbing shoes. This allows students to get better purchase on holds as well as preserving the wall
- mandatory use of safety equipment – all climbers use helmets, ropes and harnesses
- adequate supervision: ensure students are supervised and behaving appropriately, using the safety equipment and correct climbing technique
- qualified instructors: ensure all instructors have current and up-to-date qualifications.

Question 12

Students had some difficulty with this question. Question 12a. was done reasonably well but students were unable to discuss the relationship between oxygen uptake and intensity. Many were able to establish that the relationship was linear but failed to then discuss what happens after VO_2 max is reached as shown by the decrease in the graph, even with an increase in speed. In 12c. students had trouble with the term ‘detrimental’.

12a.

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



As the exercise intensity increases, and the lactate inflection point (LIP) is exceeded, lactate will begin to accumulate faster than it can be removed by the body.

12b.

Marks	0	1	2	3	Average
%	71	21	7	2	**0.4**

There is a direct linear relationship between oxygen uptake and exercise intensity. Once VO_2 max is reached, even with further increases in exercise intensity, there is no further increase in oxygen uptake as shown by the decrease in the graph at 22 km/hr mark.

12c.

Marks	0	1	2	3	Average
%	69	20	8	3	**0.5**

Increasing VO_2 max. is an aerobic adaptation – working above VO_2 max means an increased contribution from the anaerobic energy systems. You cannot train at this intensity for long enough to illicit an aerobic adaptation, therefore the training is not specific to the aim of increasing VO_2 max.