Physical Education GA 3: Written examination

GENERAL COMMENTS

The paper proved accessible for students with most attempting all questions. However, many students were unable to demonstrate a sound knowledge of fitness testing and the application of principles of training. This may reflect an increase in the emphasis on 'book learning' rather than learning through involvement in testing and training. It is essential that teachers continue to emphasise the importance of involvement in an extensive range of training and testing in practical and laboratory activities.

Accurate reading and interpretation of the stem to questions continues to be a problem area for many students. It is important that in preparing for the examination students practise analysing and identifying critical information provided in the stem of questions.

SPECIFIC INFORMATION

It should be noted that the suggested solutions are not intended to cover all possible satisfactory responses. In some instances possible high-level and low-level answers have been provided.

Question	Marks	%	Response
Question 1	This question was generally well done. A few students incorrectly answered that the component of fitness being demonstrated was strength.		
	a–e		**a**
	0/5	5	Local Muscular endurance
	1/5	12	**b**
	2/5	16	Abdominals
	3/5	23	**c**
	4/5	26	Isometric
	5/5	18	**d**
	(Average mark 3.07)		Isotonic eccentric
			e
			Flexion
Question 2	Part a) was answered correctly by most students. In part b), some students had difficulty in linking triglyceride stores with fibre type. Many who were able to do this found it difficult to expand the answer to explain the reason.		
	a–b		**a**
	0/4	5	i) A
	1/4	5	ii) C or D
	2/4	40	**b**
	3/4	15	Fast twitch fibres will have lower levels of triglyceride because they are suited to
	4/4	35	anaerobic energy production and will store more glycogen to facilitate this.
	(Average mark 2.71)		OR
			The opposite answer using fast twitch fibres and higher levels.
Question 3	This question was written to elicit responses related to acute training effects. Nearly all students interpreted the question this way, but a small number of students interpreted the question as being about recovery. These students received marks for the question if they answered correctly. In part a) a common error was to list cardiovascular rather than muscular changes. In part d), many students appeared to misunderstand the difference between a training principle and a training method, with many providing 'interval training' as their response rather than specificity. Part f) saw many students simply restate a facet of warm down such as stretching, rather than a separate action that could be taken by the athlete.		

a–c

0/6	4
1/6	5
2/6	12
3/6	17
4/6	21
5/6	22
6/6	17

(Average mark 3.83)

a

Increased

- Muscle lactate
- Body/muscle temperature
- Blood flow
- Enzyme activity
- Rate of aerobic and anaerobic glycolysis
- Myoglobin activity

Decreased

- Glycogen store
- Triglycerides
- ATP-PC concentration

b

Line B

c

Higher energy expenditure

Work output of midfielder is high so a high percentage of energy will come from Glycogen

d–f

0/7	4
1/7	8
2/7	8
3/7	9
4/7	11
5/7	17
6/7	22
7/7	21

(Average mark 4.61)

d

Specificity

e

	Type of effect		
Training Effect	**Cardiovascular**	**Respiratory**	**Muscular**
ACUTE	↑ HR ↑ SV ↑ Systolic BP ↑ vasodilation ↑ a-vO2 diff ↑ Cardiac Output (Q)	↑ tidal volume ↑ ventilation ↑ breathing rate ↑ pulmonary diffusion	
CHRONIC	↓ resting HR ↓ HR at same exercise intensity ↑ Q at work ↑ SV ↑ a-vo2 diff ↑ blood volume Increased haemoglobin levels Cardiac hypertrophy		Hypertrophy ↑ enzyme concentration ↑ vascularisation ↑ capillarisation ↑ glycogen stores ↑ triglyceride stores ↑ ATP-PC stores ↑ force of contraction ↑ mitochondria ↑ myoglobin ↑ LA tolerance

f

- rehydrate with glucose and electrolyte drinks
- massage muscle areas fatigued
- eat food containing simple carbohydrates or with high glycaemia index
- hot and cold applications
- ice baths
- hydrotherapy

Question 4

This question was generally well done. It was of concern that some students were unable to work out the answer to part a). In parts e), f) and g) many students simply answered with acronyms such as NOHARM, RICER or SALTAPS when the question required them to provide specific procedures or advice.

<table>
<tr><td></td><td>a–d
0/4 2
1/4 11
2/4 32
3/4 39
4/4 16
(Average mark 2.55)</td><td>a
192 bpm
b
Flexibility or static flexibility
c
Young (13 yo) or female or due to training flexibility five times per week
d
Mainly aerobic training or female so lower power to weight ratio or age – she is older</td></tr>
<tr><td></td><td>e–g
0/6 1
1/6 3
2/6 11
3/6 20
4/6 26
5/6 20
6/6 19
(Average mark 4.03)</td><td>e
Any two of Ice or Compression or Elevation (NOT Rest or Stop Play Or Seek help as these are already indicated in the question stem)
f
Continue rest, ice, compression, elevation, avoid alcohol, no massage or heat, seek professional advice
g
Commence massage, stretching, apply heat, seek professional advice, begin low intensity exercise</td></tr>
<tr><td>Question 5</td><td colspan="2">Question 5 elicited a range of responses indicating that students are not just rote learning things such as the characteristics of a respected coach. Two common errors were for students to list particular coaching styles such as authoritarian or to simply reword the same characteristic.</td></tr>
<tr><td></td><td>a–b
0/4 7
1/4 9
2/4 16
3/4 31
4/4 37
(Average mark 2.82)</td><td>a
Acceptable answers included:
• knows the game/s well
• can teach skills
• can analyse skills accurately
• good manager and communicator
• understands fitness training principles
• motivating and enthusiastic
• knowledge of sports psychology
• can assess injury and advise on treatment
• knowledge of pre game and recovery strategies
• patient and persistent
• a person of integrity and role model.
b
Students were required to discuss in detail how one of the chosen characteristics contributes to the improved performance.
A sample high-level answer might be:
Ric understands principles of training so he trains players emphasising midfielder’s aerobic capacity more than the key forwards who do more strength work.</td></tr>
<tr><td>Question 6</td><td>0/4 10
1/4 13
2/4 30
3/4 16
4/4 31
(Average mark 2.45)</td><td>Many students presented a general rather than a specific technological change, e.g. ‘better swim suits’ rather than specifying material type or ‘full body suits’. The second part of the answer was often incomplete, with many students simply stating that the change created faster times rather than specifying how this occurred.
This table presents a range of acceptable answers with abbreviated solutions :
<table><tr><th>Technological change</th><th>How it has contributed to improved performance</th></tr><tr><td>• Use of Video cameras
• Biomech analysis
• Full length swimsuit Lycra (etc.) material
• Deeper pools
• Use of lane ropes
• Waveless pools
• ten lane pools use eight lanes
• Shaving down
• Starting block changes</td><td>• Provide feedback/technique/improve coaching
• Provide feedback/technique/improve coaching
• Decrease drag
• Decrease drag
• Deep pools decrease friction b/w swimmer and bottom
• Decrease wave action
• Decrease resistance from wave action
• Decrease resistance
• Decrease resistance, psychological factors</td></tr></table></td></tr>
</table>

Question 7

0/6	1
1/6	0
2/6	1
3/6	5
4/6	15
5/6	30
6/6	48
(Average mark 5.16)	

Most students were able to achieve close to full marks for this question. A common error was to repeat the same answer more than once.

The answers in the table are abbreviated.

	Commercial gym	**Personal trainer**	**Do it yourself**
Advantage	- Social interaction - Image - Variety of programs and equipment available - Expert advice	- Provides increased motivation - Individual attention - Decreased risk of injury - Can come to you, therefore saves time.	- Cost effective - Flexible - Self reliant - Privacy
Disadvantage	- Cost - Crowded - Intimidating - Transport to gym - Self conscious	- Expensive - No social interaction	- Injury - Ineffective program - Lack of knowledge - Boredom - Lower motivation

Question 8

Parts a) and b) were well done by most students. In part c) a number had difficulty in focusing on the specific characteristics of the program that made it attractive preferring to write generally about fun or enjoyment rather than the reason it may be so.

a–c

0/4	3
1/4	9
2/4	22
3/4	35
4/4	31
(Average mark 2.82)	

a

Participation decreases after age 11 **or** participation increases until age 11

b

- problems getting to venues
- other interests/study demands
- body image
- decreased parental influence
- more competitive/structured sport turns kids off
- less modified sports available for older children
- peer group pressure.

c

- peers accept these type of activities are improving to self-image
- less supervised
- less structured
- non competitive
- no uniform
- no rules.

di–iii

0/2	5
1/2	34
2/2	61
(Average mark 1.56)	

- decreased vandalism
- increased connectedness
- young people are off the streets
- local businesses have increase in sales of equipment
- positive image for council and community
- increased fitness of community
- decreased health and medical expenses in the community.

Question 9

This question was generally well done. Some students were not able to list a specific factor for a) and c) with many stating that people begin participating or continue to participate because they ‘enjoy the sport’ rather than stating the reason behind this.

	a–d 0/6 6 1/6 4 2/6 15 3/6 25 4/6 18 5/6 14 6/6 18 (Average mark 3.6)	**a** • relatively high cost • limited media coverage • lack of role models • skiing not taught and promoted in many schools • lack of family involvement. **b** A sample high level answer might be: People without high disposable incomes cannot afford to ski regularly due to cost of tows, ski hire, and transport. **c** • success in competition • social interaction • fitness benefits • extrinsic factors such as rewards, trophies or money or the prospect of these • excitement/danger/challenge/thrill of the sport • financial support from sponsors or government • intrinsic factors (specified). **d** A sample high level answer might be: Individuals may become more involved in skiing because they are achieving success in winning races and can see the prospects of becoming famous and successful in the sport. A lower level answer might be: Individuals may continue to ski because most of their friends do
Question 10	A common error in this question was to focus on equipment or playing surface rather than a characteristic of the players in part a). In part b) most students chose to list modifications to ensure 'safety' rather than factors leading to equitable participation.	
	a–b 0/4 4 1/4 16 2/4 30 3/4 28 4/4 22 (Average mark 2.47)	**a** • physical size of players • skill levels • experience in the game • knowledge of the game • fitness level. **b** • modify the rules or give specific examples of these • play players on appropriate sized/skilled opponents • share time in the favoured positions • insist on protective clothing for all players • ensure safe playing environment – surface, boundaries, protective equipment.
Question 11	Part a) was generally well answered, however in part aii) some students did not recognise the explosive nature of the start of the test and answered speed rather than power. Most students were able to successfully and accurately read the graph to provide a correct answer to part b). In part c) many students had difficulty recognising the conjunction of aerobic and anaerobic energy required to produce very high intensity activity. In part d) a number did not recognise that the test described is not being conducted at maximal intensity. In part e) many students did not recognise that the principle of specificity dictates that the training emphasis must be based on the proportional energy system contributions of the specific event rather than a test.	
	a–c 0/4 4 1/4 17 2/4 38 3/4 34 4/4 7 (Average mark 2.22)	**a** i) ATP-PC ii) Power (Anaerobic Power), muscular power **b** 32–36 % **c** Extra energy is provided anaerobically

	d–e 0/2 50 1/2 42 2/2 8 (Average mark 0.58)	**d** The test shown in the graph is not conducted at maximal intensity but a 400m run is. This leads to different proportional contributions of anaerobic and aerobic systems **e** 40% (Because the athlete should be training specifically for the event. The proportion of each energy system targeted should be the same as for the event.)
Question 12	Part a) of this question was generally poorly done. Many did not explain how factors such as reduced blood pressure, which are produced by exercise, directly lead to reduced likelihood of cardiovascular disease. Most students responded listing fitness effects of physical activity without explaining a link to cardiovascular disease. While parts b), c) and d) were answered well by most students, parts e) and f) were not. Many students tried to relate the graph to heart rate differences associated with age. This graph is commonly displayed to demonstrate the concept of a target heart rate zone for aerobic training. It was disappointing to find many students unable to recognise it.	
	a–b 0/4 11 1/4 24 2/4 29 3/4 23 4/4 13 (Average mark 2.01)	**a** **Decreased** - Body fat/weight - Systolic blood pressure - Cholesterol levels **Increased** - Arterial wall elasticity A sample high-level answer might be: Physical activity over a long period lowers systolic blood pressure reducing pressure on arterial walls and strain on the heart. **b** **Increased** - Social activity - Self esteem/sense of achievement - More productive lifestyle - Stress reduction - Health and fitness - Skill development - Decreased health care costs
	c–d 0/4 15 1/4 14 2/4 16 3/4 26 4/4 29 (Average mark 2.4)	**c** **Decreased** - Blood volume - Muscle mass/strength - Reaction time - Slower protein synthesis - Recovery rates - Basal Metabolic rates - Cardiac output OR stroke volume - Increased body fat levels/decreased power to weight ratio - VO2 max - Flexibility - Anaerobic threshold - Lung capacity/ventilation **d** Sample high level answers might be: Decreased blood volume means less oxygen available at muscles so lower energy output. Decreased muscle mass means lower energy production so reduced power output and reduced fuel stores
	e–f 0/2 67 1/2 25 2/2 8 (Average mark 0.41)	**e** Anaerobic threshold ***or*** the max heart rate for training aerobically at particular ages **f** The training zone for aerobic training ***or*** continuous training zone

<table>
<tr><td>Question 13</td><td colspan="2">Part a) was well understood but a number of students found it difficult to explain what the ability to restore the ATP-PC stores between sprints meant in terms of the system being used and the resultant physiological capacity which is being trained.</td></tr>
<tr><td></td><td>a–b
0/4 28
1/4 36
2/4 23
3/4 10
4/4 3
(Average mark 1.23)</td><td>a
ATP-PC can be partially restored with longer recovery. This will allow the next interval to be performed using ATP-PC meaning that it is the system being trained.
b
Anaerobic power/Anaerobic capacity. This had to be linked to the ATP-PC system and it’s replenishment.</td></tr>
<tr><td>Question 14</td><td colspan="2">Students performing better in the examination were generally able to describe the physiological change brought about by the training. A common error was to respond regarding lactate tolerance rather than threshold. In part b) very few students were able to recognise and explain that lactate is oxidised during performance.</td></tr>
<tr><td></td><td>a–b
0/4 39
1/4 35
2/4 18
3/4 6
4/4 2
(Average mark 0.97)</td><td>a
i) OBLA (anaerobic threshold) has been raised by improving aerobic capacity through training
ii) 85–95%
b
Blood LA levels only reflect net accumulation of Lactic Acid, not the rate of anaerobic glycolysis. This is because lactic acid is being oxidised during the performance.</td></tr>
<tr><td>Question 15</td><td colspan="2">Some students found difficulty in providing different factors in part b) to those given in part a).</td></tr>
<tr><td></td><td rowspan="2">a–b
0/4 7
1/4 14
2/4 31
3/4 34
4/4 14
(Average mark 2.33)</td><td>a
- Different role models, e.g. Shane Warne
- Improved coaching – more coaching of spinners
- Media coverage of the benefits of spin bowling
- Merchandising of speciality balls</td></tr>
<tr><td>b
- Ethnic influence
- Role of media: TV – coverage showing greater range of sports, Aussie sports, school sports programs or specific programs promoting sports.</td></tr>
<tr><td>Question 16</td><td colspan="2">While many students were able to provide general answers to most parts of this question, there was overall difficulty in providing specific, accurate and feasible examples of how training principles could be applied and overload achieved for the training program given.</td></tr>
<tr><td></td><td>a–c
0/7 14
1/7 5
2/7 10
3/7 18
4/7 16
5/7 16
6/7 15
7/7 6
(Average mark 3.54)</td><td>a
Short interval training or sprint interval training
b
Sample high-level answers might be:
• Frequency: ‘Do a minimum of three sessions per week on alternate days’
• Intensity: ‘Ensure speed is high enough to elevate HR to target levels use this to set target times and keep to them’
• Specificity: ‘Perform near maximum sprints, e.g. 6–15 reps x 40–60 metres’
c
- Decrease the rest
- Increase the repetitions
- Decrease running time
- Increase the sprint distance, e.g. to 80m
- Increase the intensity by dragging a weight or a load, running up an incline, applying resistance
- Include another training session for the week.</td></tr>
<tr><td>Question 17</td><td colspan="2">Most students were able to provide a definition of the terms but found it difficult to ‘describe their role’. Many students described the role of haemoglobin rather than myoglobin in part b).</td></tr>
</table>

<table>
<tr><td></td><td>i–iii
0/3 33
1/3 26
2/3 22
3/3 19
(Average mark 1.27)</td><td>i
Mitochondria – site of aerobic energy production within the cell
ii
Myoglobin – substance in the cell that attracts oxygen into the muscle cell
iii
Glycogen – the stored form of glucose found in muscle cells, converted to glucose for use in energy (ATP) production</td></tr>
<tr><td>Question 18</td><td colspan="2">Part b) proved difficult for many students. Those able to mention muscle fibres frequently did not mention the motor neuron. Part c) was generally poorly done. Many students provided answers like ‘The whole muscle contracts’ and some confused the ‘all or none law’ with preferential recruitment.</td></tr>
<tr><td></td><td>a–c
0/5 4
1/5 51
2/5 20
3/5 12
4/5 7
5/5 6
(Average mark 1.87)</td><td>a
100
b
The motor neuron (or nerves) together with all the muscle fibres that it controls
c
The impulse along the motor neuron must be strong enough to bridge the synapse (reach the threshold). All the muscle fibres in a motor unit will contract fully or none will.</td></tr>
<tr><td>Question 19</td><td colspan="2">Many students were able to answer correctly in part a) but were unable to offer an explanation in part b). Answers to part b) frequently indicated that students misread or misinterpreted the question as being about VO_2 max rather than $a-VO_2$ difference.</td></tr>
<tr><td></td><td>a–-b
0/5 10
1/5 19
2/5 23
3/5 24
4/5 12
5/5 12
(Average mark 2.43)</td><td>a
<table><tr><th></th><th>Answer</th></tr><tr><td>Pairing # 1</td><td>B or Same</td></tr><tr><td>Pairing # 2</td><td>B or Same</td></tr><tr><td>Pairing # 3</td><td>B</td></tr></table>b
For answer ‘B’
The trained athlete will have more efficient function at cellular level in terms of diffusion/extraction of oxygen.

For answer ‘the same’
The sedentary person will be working at a higher % of their max capacity of HR, $a-VO_2$ diff, Q. (e.g. if athletes max $a-VO_2$ diff is 18 and sedentary persons is 12 at 8kmh athlete is $\frac{1}{3}$ of capacity, i.e. 6; sedentary person is $\frac{1}{2}$ capacity, i.e. 6)</td></tr>
<tr><td>Question 20</td><td colspan="2">A common error was to confuse EPO with blood doping. In part c) many students answered ‘carbohydrate loading’. While this will improve performance it will not do so by increasing red blood cell or haemoglobin levels as is the case with EPO.</td></tr>
<tr><td></td><td>a–c
0/5 24
1/5 20
2/5 17
3/5 18
4/5 16
5/5 5
(Average mark 1.96)</td><td>a
EPO increases RBC or haemoglobin levels, O_2 carrying capacity.
b
• heart attack
• heart failure
• infection from injection
• increased blood viscosity
• deep vein thrombosis
• death
• increased systolic blood pressure.
c
- Altitude training (or hypobaric chamber)
- Sleep at high altitude, train at low altitude
- Endurance training, aerobic training or a description of this.</td></tr>
<tr><td>Question 21</td><td colspan="2">Many students did this question poorly. Most were unable to identify the involvement of insulin and its effect on blood glucose levels and resultant performance changes. Many students wrote about ‘hitting the wall’ but appeared to have little understanding of the physiology relating to it.</td></tr>
</table>

<table>
<tr><td></td><td>a–c
0/6 38
1/6 22
2/6 14
3/6 11
4/6 6
5/6 4
6/6 4
(Average mark 1.53)</td><td>a
Blood glucose will increase. This causes an insulin surge increasing reliance on muscle glycogen
OR
increases fluid loss into gut increasing dehydration
Leads to decreased performance due to difficulty in mobilising glycogen
OR
due to dehydration
b
Fats are used early in the race sparing glycogen
c
- By ‘glycogen sparing’ he can work at a higher intensity later in the race
- Because he is using glycogen rather than fat (which is a less efficient energy source).</td></tr>
<tr><td>Question 22</td><td colspan="2">Most students were able to provide adequate answers with regard to carbohydrate loading but many answers demonstrated only a very basic understanding of time frame and suitable foods required for this regime. Very few students focused on tapering.</td></tr>
<tr><td></td><td>a–c
0/4 10
1/4 20
2/4 24
3/4 30
4/4 16
(Average mark 2.22)</td><td>a
Carbohydrate Loading (or eating more CHO), or Tapering
b
Sample high level answers might be:
Loading – ‘Increase the proportion of Carbohydrates in the diet in the 24–72 hrs prior to the event’
Tapering – ‘Training should be reduced by 50% the week prior to the event’.
Lower level answers might be:
Loading – ‘eat more carbohydrates in the lead up to the tournament or matches’
Tapering – ‘ease off training before the event’
c
Glycogen, (Carbohydrate or glucose)</td></tr>
<tr><td>Question 23</td><td colspan="2">Most students were able to satisfactorily answer part b) of this question. This may have been due to them focusing on the 3 minute given interval time rather than an in depth understanding of recovery.
Two possible answers as below.</td></tr>
<tr><td></td><td>a–b
0/2 28
1/2 47
2/2 25
(Average mark 0.97)</td><td>Possible response 1
If the athlete is focusing on improving aerobic fitness by increasing VO_2 max:
70–85% then short rest, e.g. 0–3 minutes
OR
Possible response 2
If the athlete is focusing on improving aerobic fitness by increasing anaerobic threshold:
85–95% then 3–6 minutes rest.</td></tr>
</table>