

VCE Physical Education Units 3&4

Written Examination

Suggested Solutions

SECTION A – MULTIPLE-CHOICE QUESTIONS

1	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
2	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
3	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
4	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
5	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
6	<input type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/> C	<input type="checkbox"/> D
7	<input type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/> C	<input type="checkbox"/> D
8	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
9	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
10	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
11	<input type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/> C	<input type="checkbox"/> D
12	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
13	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
14	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
15	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D

Question 1 B

B is correct and **A** is incorrect. A discrete skill is characterised by having a distinct beginning and end point; a continuous skill has no distinct beginning or end point.

C is incorrect. Fine motor skills, not discrete skills, involve the use of small muscles groups and fine touch control.

D is incorrect. Closed skills, not discrete skills, are predictable and self-paced.

Question 2 B

B is correct. Narrow-internal focus is used to focus thoughts and mentally rehearse upcoming movements; to complete the game, the snooker player would need to focus her thoughts and mentally rehearse the required shot before playing.

A is incorrect. Narrow-external focus relies on focusing on very few external cues, such as a soccer goalie focusing on the moving ball while waiting to take an unopposed chest mark.

C and **D** are incorrect. Broad focus involves assessing outside factors such as wind conditions, the crowd and other players, which do not occur in this scenario.

Question 3 D

D is correct. Enhanced feelings of self-worth is an intrinsic factor as the motivation to succeed comes from within the individual.

A, **B** and **C** are incorrect. These are examples of extrinsic motivation, which has an external focus and usually involves some form of material benefit, such as a trophy, prize money or recognition from others.

Question 4 A

A is not a chronic adaptation of high-intensity interval training (HIIT) and is therefore the required response. HIIT is an aerobic training method that involves repeated work and rest intervals performed at an intensity close to maximum oxygen uptake (VO_2 max). HIIT does not result in greater amounts of myoglobin within the skeletal muscle.

B is an adaptation of HIIT and is therefore not the required response. HIIT leads to increased capillarisation of the skeletal muscle, which allows for greater supply of oxygen and nutrients to the muscle.

C is an adaptation of HIIT and is therefore not the required response. HIIT causes an increase in oxidative enzymes, which oxidise triglycerides more efficiently, thus sparing glycogen.

D is an adaptation of HIIT and is therefore not the required response. HIIT leads to an increase in the size, number and surface area of mitochondria within the muscle.

Question 5 A

A is correct. Stroke volume is the amount of blood ejected from the left ventricle with each heartbeat; therefore, an increase in stroke volume is an acute response in the cardiovascular system.

B, **C** and **D** are incorrect. These are acute responses in the respiratory system.

Question 6 C

C is correct. The 200 m sprint event is a high-intensity activity with a short duration that results in a rapid decrease in intramuscular creatine phosphate stores.

A is incorrect. Thermoregulation does not play a major part in fatigue because of the short duration of the 200 m sprint event.

B is incorrect. As the 200 m sprint event is of short duration, glycogen stores will not be depleted.

D is incorrect. The anaerobic glycolysis system will only contribute minimally to this event and therefore there will not be an accumulation of metabolic by-products (H^+ ions).

Question 7 C

C is correct. These are the appropriate sets, repetitions (reps) and load (% of one repetition maximum, or RM) to enhance the fitness component of muscular strength.

A is incorrect. To enhance overall muscle size (hypertrophy), the reps should be approximately 1–12 and the load (% of one RM) should be 70–100.

B is incorrect. To enhance muscular endurance, the load (% of one RM) should be 40–60 because the individual needs to be able to put the muscle under tension for a greater number of reps.

D is incorrect. To enhance muscular power, the sets should be 3–6. The given sets (1–2) are not enough to bring about muscular power adaptations.

Question 8 D

D is correct. Plyometric training involves the use of muscles to perform an eccentric contraction followed by a rapid concentric contraction. It is an effective way to improve an athlete's force and power production. A chronic adaptation of plyometrics is an increase in ATP–CP fuel stores, which allows for a faster resynthesis of ATP–CP for higher intensity activities. This is the appropriate training method and chronic adaptation for the fitness component of muscular power.

A is incorrect. Fartlek training is a type of enduring training that involves short bursts of high-intensity exercise and aims to improve an athlete's aerobic power. The chronic adaptation of improved motor unit recruitment occurs as a result of anaerobic or resistance training, not endurance training.

B is incorrect. Short interval training is a type of anaerobic training that involves short bursts of exercise with a work-to-rest ratio of approximately 1 : 6. Decreased heart rate at rest is a chronic adaptation that occurs as a result of aerobic training, not anaerobic training.

C is incorrect. Aerobic power, not aerobic capacity, is the correct fitness component for this option.

Question 9 D

D is correct. Momentum is a combination of mass and velocity, where mass (measured in kilograms) is multiplied by velocity (measured in metres travelled per second) to give momentum.

A and **B** are incorrect. Momentum is not a measurement of force.

C is incorrect. Momentum is not mass divided by velocity.

Question 10 B

B is correct. Once the diver leaves the diving board, angular momentum is always conserved. The diver can alter the moment of inertia by moving body parts into different positions; during the tuck, the moment of inertia decreases significantly.

A and **D** are incorrect. Angular momentum does not increase or decrease.

C is incorrect. The moment of inertia decreases when the diver tucks to perform the somersault.

Question 11 C

C is correct. At the conclusion of the run, Sharmilla's body will not immediately return to a resting state, despite the dramatic decrease in demand for ATP resynthesis. Rather, her oxygen uptake remains temporarily elevated to break down metabolic by-products in order to replenish ATP, creatine phosphate and glycogen, and to replace any oxygen that has been borrowed from the myoglobin.

A is incorrect. Oxygen deficit usually occurs at the start of the period of exercise and at any stage during an exercise period where intensity increases.

B is incorrect. Glycogen is not oxidised primarily by the anaerobic glycolysis system during a steady state period; it is oxidised during steady state via the aerobic energy system.

D is incorrect. Cardiac output and respiratory rate do not increase during this period.

Question 12 A

A is an incorrect statement and is therefore the required response. Oxygen deficit is the state in which there is a shortfall between oxygen supply and oxygen demand. Oxygen deficit can occur whenever there is an increase in intensity, such as at the start of the race (between 0 and 3 minutes). In this race, there was also an increase in intensity at the 11-minute mark, shown by an increase in heart rate; therefore, a second oxygen deficit has occurred.

B, **C** and **D** are correct statements and are therefore not the required response.

Question 13 A

A is correct. Arteriovenous oxygen ($a-vO_2$) difference is a measure of the difference in the concentration of oxygen in the arterial blood and the concentration of oxygen in the venous blood. Cardiac output is the amount of blood ejected from the left ventricle per minute. $a-vO_2$ difference and cardiac output are important in measuring VO_2 and VO_2 max as they are the main factors responsible for the body's total oxygen consumption. VO_2 max is therefore the product of $a-vO_2$ difference and cardiac output.

B, **C** and **D** are incorrect. VO_2 max is not a product of stroke volume, heart rate or ventilation.

Question 14 D

D is correct. Kipchoge is able to work at higher intensities aerobically because he has developed an increase in mitochondria through aerobic training. An increase in mitochondria allows the body to convert energy into ATP more efficiently, meaning that more energy is available to working muscles for longer periods of time at higher intensities.

A, **B** and **C** are incorrect. These options are chronic adaptations of the muscular system caused by anaerobic training.

Question 15 D

D is correct. The session protocols for this option are within the accepted ranges for HIIT.

A is incorrect. For HIIT, a minimum of three sessions per week is required.

B is incorrect. For HIIT, the work-to-rest (W : R) ratio must be 1 : 1 or 1 : 2.

C is incorrect. For HIIT, the intensity must be 90–100% heart rate (HR) max or 90–100% VO_2 max.

SECTION B**Question 1** (14 marks)

a. cognitive 1 mark

b. *Any two of:*

- The learner is a complete beginner.
- The learner is unable to detect and correct errors.
- The learner's attention is given to understanding the performance of the skill only.
- There are many errors in the learner's performance.
- It is classified as trial and error learning.
- The learner's movements are inconsistent and unrelaxed.

2 marks

1 mark for identifying each characteristic (two required).

*Note: Consequential on answer to **Question 1a**.*

c. task constraint 1 mark

d. Implicit learning is learning through doing, such as completing a task. For example, the Auskick footballers may learn how to handball by playing in smaller-sized handball games with the coach as the facilitator. 1 mark

Explicit learning is learning that takes place as a result of direct instruction, such as from a coach, where the performer is told what to do and when to do it. For example, the coach may provide instruction to the Auskick footballers about the fundamentals of a handball. 1 mark

e. **Practice distribution:** distributed practice 1 mark

Distributed practice involves scheduling short, frequent training sessions with more time for rest periods during the session. The rest periods enable the cognitive learner, such as the Auskick footballers, to digest the coach's instructions and reflect upon what they have learnt (memory consolidation). 1 mark

Practice variability: blocked practice 1 mark

Blocked practice involves practicing the same skill repetitively in a predictable environment with few variables. It works best when beginners, such as the Auskick footballers, are trying to master a new skill, the task is relatively simple and the physical demands of the task are low. 1 mark

Note: Responses for practice distribution could also state that this type of practice is most appropriate for those learning a new skill, if the performer is young/lacks concentration, or if the performer lacks motivation.

f. Any one of:

- Family: If the learner has siblings or other family members that have played Australian rules football and/or Auskick, they may observe skills and become involved in the program earlier.
- Gender: If there are teams/opportunities for all genders to participate in Auskick, this may increase the likelihood of participation.
- Role models: If the learner has an Australian rules football and/or Auskick role model to look up to, this may increase the likelihood of participation.
- Socioeconomic status: If the learner’s family can afford the Auskick membership, equipment, coaching, uniform and testing equipment costs, the learner may be more likely to participate.
- Local community: If there are teams, coaches and facilities available locally, there may be more opportunities for the learner to participate in Auskick.
- Cultural norms and expectations: If Australian rules football (or another sport that is similar to Australian rules football) is a sport that is culturally significant for the learner, they may be more likely to participate in Auskick.

2 marks

1 mark for identifying a sociocultural factor.

1 mark for explaining how the factor could influence the success of the Auskick program.

g. Knowledge of performance feedback enables the learner to understand how they performed by analysing skill technique and the critical features of a skill and, consequently, learn why their performance was successful or unsuccessful.

1 mark

Knowledge of results also provides information about the relative success of the skill performance; however, it will not always offer explanations as to why the skill was performed successfully or unsuccessfully.

1 mark

Question 2 (7 marks)

a. $a-vO_2$ difference is a measure of the difference in the concentration of oxygen in the arterial blood and the concentration of oxygen in the venous blood.

1 mark

b.

Acute respiratory responses	Acute cardiovascular responses
<p><i>Any two of:</i></p> <ul style="list-style-type: none"> • increased respiratory frequency • increased tidal volume • increased oxygen uptake • increased pulmonary diffusion • increased ventilation 	<p><i>Any two of:</i></p> <ul style="list-style-type: none"> • increased cardiac output • increased stroke volume • increased heart rate • increase blood pressure (systole) • increased $a-vO_2$ difference • increased redistribution of blood flow

4 marks

1 mark for identifying each acute respiratory response (two required).

1 mark for identifying each acute cardiovascular response (two required).

c. *Any one of the following explanations for acute respiratory responses:*

- Increased respiratory frequency: More oxygen would have been supplied to McKeon's lungs per minute, enabling her to work at higher intensities aerobically.
- Increased tidal volume: Greater volumes of oxygen would have been supplied to McKeon's lungs per breath, enabling her to work at higher intensities aerobically.
- Increased oxygen uptake: Greater volumes of oxygen would have been diffused to McKeon's blood, enabling her to work at higher intensities aerobically.
- Increased pulmonary diffusion: Greater volumes of oxygen would have been diffused to McKeon's blood across the alveoli/capillary membrane, enabling McKeon to work at higher intensities aerobically.
- Increased ventilation: Greater volumes of oxygen would have been supplied to McKeon's lungs and expired higher levels of carbon dioxide, enabling McKeon to work at higher intensities aerobically.

Any one of the following explanations for acute cardiovascular responses:

- Increased cardiac output: An increased amount of blood ejected from the left ventricle per minute would have been pumped to McKeon's working muscles to resynthesise ATP and oxidise metabolic by-products.
- Increased stroke volume: An increased amount of blood ejected from the left ventricle per heart beat would have been pumped to McKeon's working muscles to resynthesise ATP and oxidise metabolic by-products.
- Increased heart rate: An increased number of heart beats would have pumped more blood to McKeon's working muscles to resynthesise ATP and oxidise metabolic by-products.
- Increased blood pressure (systole): Systolic blood pressure is increased as blood is forced out of the heart, so more oxygen would have been provided to McKeon's working muscles to resynthesise ATP and oxidise metabolic by-products.
- Increased a-vO₂ difference: During McKeon's performance, the amount of oxygen extracted from arterioles would have increased to enable greater levels of aerobic production.
- Increased redistribution of blood flow: Blood flow to McKeon's working muscles would have increased to resynthesise ATP and oxidise metabolic by-products as blood flow to non-essential organs would have decreased.

2 marks

1 mark for explaining how the selected acute respiratory response would have assisted McKeon's performance.

1 mark for explaining how the selected acute cardiovascular response would have assisted McKeon's performance.

Question 3 (6 marks)

- a. As heart rate increases, so does blood lactate. 1 mark

As the average player goes from a small field to a large field, there is an increase in blood lactate concentration from 3.6 to 4.8 mmol/L, demonstrating that the player is working at a higher intensity. 1 mark

An increase in metabolic by-products results in greater fatigue for the player on the large field due to an increase in the anaerobic energy system usage. 1 mark

OR

CP depletion is a factor that can cause fatigue on both field sizes. 1 mark

However, this will most likely be a greater factor for playing on the large field as the high-intensity activity (shown through the rating of perceived exertion) is higher on the large field, at 9, as opposed to 6 on the small field. 1 mark

Therefore, the average player on the large field uses the anaerobic glycolysis system more, resulting in higher lactate levels and an increased percentage of maximum heart rate. 1 mark

Note: Glycogen depletion would not be a fatiguing factor in the modified Australian football game as the game duration is only five minutes. Therefore, fuel depletion is not an appropriate response for this scenario.

- b. Open skill: The handball could be classified as an open skill within a game scenario as there is environmental unpredictability, such as the weather and crowd involvement. The handball skill is externally paced, meaning there are defenders around the player, coercing a handball decision. There is also increased inter-trial variability, meaning the handball skill changes when playing in a game situation due to the added pressure to perform and execute the skill well.

OR

Closed skill: The handball could be classified as a closed skill because the handball could occur between two players in a very predictable environment, such as indoors. In this scenario, the skill could be internally paced, which means the individual determines when to handball the ball, such as when handballing a ball to another player in a training session. In this case, there is also limited inter-trial variability, meaning there is little pressure to handball the ball to a teammate in training.

3 marks

1 mark for justifying the chosen skill type in terms of a predictable/unpredictable environment.

1 mark for justifying the chosen skill type in terms of being externally/internally paced.

1 mark for justifying the chosen skill type in terms of inter-trial variability.

Note: In this question, marks are awarded for appropriately justifying the chosen skill type, not for classifying the skill as either an open or a closed skill.

Question 4 (8 marks)

As Stephanie Gilmore sprints 20–30 m down the sand, all three energy systems contribute to ATP resynthesis. 1 mark

The ATP–CP system will be the dominant system due to its ability to provide energy at the fastest rate. 1 mark

As Gilmore begins to paddle out through the waves, her anaerobic glycolysis system will become the dominant system in maintaining the high-intensity paddle due to the low yield of the ATP–CP system, where CP depletion will be the fatiguing factor. 1 mark
1 mark

The anaerobic glycolysis system has a finite capacity; thus, the aerobic system will increase its contribution as Gilmore paddles out through the waves. 1 mark

As Gilmore waits for a wave, her aerobic system will be the major supplier of energy in replenishing CP because she is performing a passive recovery. 1 mark

When she catches a wave and performs a series of powerful turns and manoeuvres, the ATP–CP system will again become the dominant energy system as it will provide energy at a faster rate and CP stores will be replenished. 1 mark

As Gilmore paddles slowly back out through the waves, her aerobic system will become the dominant system and the major supplier of energy due to the 20–30 minute duration and low-intensity nature of the activity. 1 mark

Question 5 (10 marks)

a. Evaluation: The critical features of the skill are observed, 1 mark
and errors and/or positive aspects of the players' technique are identified. 1 mark

Error correction: The coach provides verbal feedback to the players, 1 mark
which aims to provide them with knowledge of their performance and advice on how to improve technique. 1 mark

b. Qualitative movement information is descriptive and subjective information that can be observed but not measured. 1 mark

Quantitative free throw accuracy data is statistical information that is measured using numbers and values. 1 mark

Using a qualitative analysis would provide the coach with opportunities to learn more about the performer's technique. The coach could then provide feedback to the players and prescribe an appropriate form of practice for future improvement. 1 mark

The quantitative free throw accuracy data provides information that is only numerical in nature and not a critique of the performer's technique; thus, it does little to help the coach and hence the players make corrections to the performance. 1 mark

c. *Any one of:*

- Direct observation: This provides immediate feedback to the coach at a low cost and is relatively easy to carry out.
- Video recording: The recording is stored for future analysis and can be replayed or paused to obtain accurate data.

2 marks

1 mark for identifying one appropriate method of data collection.

1 mark for providing at least one benefit of using this method.

Note: Responses cannot simply refer to the type of data collection (such as a skill frequency table).

Question 6 (6 marks)

a. third-class lever 1 mark

b. The mechanical advantage of a golf club (in this case, the driver) refers to the ratio of the lengths of the force and resistance arms. 1 mark

The resistance arm of a third-class lever is always longer than the force arm. This results in the mechanical advantage of less than one or nil. 1 mark

Having a longer resistance arm is beneficial when using a golf club as this type of lever can have an increased range of motion and velocity, which can be transferred to the golf ball on contact. 1 mark

Note: Responses should state that the result increases the range of motion and velocity of the golf club, which can be transferred onto the ball. Responses that link this back to force production should not be awarded full marks.

c. Newton's first law of motion states that an object will remain at rest or stay in constant motion unless acted upon by external forces. 1 mark

The golfer will overcome the inertia of the stationary golf ball with force from the golf club when striking the golf ball. 1 mark

OR

The golf ball will stay in constant motion until acted upon by an external force such as gravity or air resistance 1 mark

Note: Responses should not simply state the 'law of inertia' without explaining the law.

Question 7 (16 marks)

a. Exercising, especially during high temperatures, causes the body to heat up. To expel heat, the body thermoregulates (produces sweat to cool itself) as a way of maintaining its internal body temperature. 1 mark

To do this, vasodilation of the body's blood vessels occurs at the surface of the skin. This controls heat loss for the cyclists but also causes vasoconstriction of the blood vessels in the muscles. 1 mark

Vasoconstriction at the site of the muscles results in a decrease in oxygenated blood, which in turn results in a decrease in the oxidation of metabolic by-products. Consequently, ATP resynthesis cannot occur at the same rate. 1 mark

As a result, the cyclists would receive greater contributions from their anaerobic glycolysis system. The cyclists' intensity during the race would decrease and their speed would slow. 1 mark

b. Consuming protein assists with muscle growth and repair, and consuming carbohydrates increases muscle glycogen stores. 1 mark

Combining the consumption of protein and carbohydrates would assist a cyclist with faster absorption of the carbohydrates. 1 mark

c. *Any three of:*

- When consumed with sports drinks, water assists in the uptake and absorption of the carbohydrates and electrolytes.
- While water rehydrates the cyclists, some sports drinks contain carbohydrates, which replace lost glycogen levels depleted during exercise.
- While water rehydrates the cyclists, sports drinks replenish electrolytes that are lost through sweat and are essential for brain function and muscle contractions.
- Sports drinks are more palatable than water and may encourage cyclists to drink more.
- Sports drinks can speed up the absorption and retention of water.

3 marks

1 mark for describing each reason (three required).

Note: Responses must refer to both water and sports drinks to receive full marks.

d. aerobic energy system 1 mark

e. increase in metabolic by-products 1 mark

f. The lactate inflection point (LIP) occurs when lactate production and lactate removal are balanced. In order to keep up with the fast pace of the race leaders as well as ride into the added resistance of the wind, the domestique would have to increase their intensity, resulting in an increased contribution from the anaerobic glycolysis system to maintain the intensity. 1 mark

As a result, there would not be enough oxygen present to supply the majority of the fuel needed for aerobic energy and the cyclist would exceed their LIP. 1 mark

g. *For example:*

active recovery 1 mark

This type of recovery will most effectively remove any metabolic by-products that may have accumulated 1 mark

and replenish oxygen levels in the myoglobin by increasing the circulation of blood. 1 mark

Note: Other possible reasons why active recovery is suitable include: keeps heart rate elevated to promote blood flow; assists with thermoregulation/reduces core temperature; provides a muscle pump for blood flow back to the heart (reduction of DOMS); and decreases venous pooling.

Question 8 (8 marks)

In terms of skill acquisition, Sienna is most likely in the associative or autonomous stage of learning as she is able to successfully strike the golf ball each time and her average distance is quite long. 1 mark

Kentaro is most likely in the cognitive or early associative stage of learning as he misses some tee off shots and his average distance is quite short compared to Sienna's. 1 mark

Sienna is able to achieve greater distances than Kentaro due to a correct summation of momentum. It is likely that she can successfully activate larger and stronger muscle groups first, such as hips, glutes and thighs, followed by smaller muscle groups, such as hands and feet. 1 mark

Sienna is able to use as many body parts as possible, enabling force to be generated over a greater time. 1 mark

Sienna shows greater stability and balance than Kentaro. 1 mark

This occurs because Sienna increases the friction between two or more bodies, such as her shoes and the ground, and ensures that her line of gravity is over a wide base of support. 1 mark

Newton's second law states that the rate of acceleration of a body is proportional to the force applied to it and the direction in which the force is applied. 1 mark

Sienna achieves a greater rate of acceleration and is therefore able to apply more force to the golf ball. This results from Sienna's greater stability and balance and ability to correctly time and sequence body segments and muscles through a range of motion by force summation, which accounts for her longer average shot distance of 195 m. 1 mark

Note: Responses can also state that Sienna has a greater stable base and is able to transfer momentum from one body part to another when at maximum velocity.

Question 9 (13 marks)

a. Any one of:

- Breathing control/techniques: The use of controlled, slow breathing could help Lawson to focus on the current task (cycling race). This may calm his mind and improve concentration and attention.
- Progressive muscle relaxation: Lawson could contract and release his muscles to help relax his muscles and help him focus his mind and body. This may improve concentration and attention.
- Cue words/routines: Lawson could develop a number of cue words and a routine to use at the start of the race that help to focus his mind and improve concentration and attention.
- Positive self-talk: Lawson could use positive self-talk to increase his confidence, concentration and attention at the start of the race.
- Mental imagery: Lawson could visualise himself performing a strong start or cycling out in front of the group. This may give him greater confidence and help to maintain focus and concentration.

2 marks

1 mark for identifying one appropriate psychological strategy.

1 mark for explaining how this strategy may improve Lawson's concentration.

Note: Meditation and listening to relaxing music are psychological strategies that can be used to improve concentration and enhance performance. However, these strategies would be best utilised before the cycling event takes place, not at the starting line. Therefore, these strategies are not acceptable answers.

- b.** Lawson's resistance training program would be somewhat effective in developing his muscular power. All exercises are lower-body exercises, which makes the program valid and specific to the sport of cycling. 1 mark

In most instances, the correct load (% of 1 RM), sets, repetitions, contraction speed and rest time were given; however, to effectively improve Lawson's performance, the following errors should be rectified.

Any two of:

- Leg curl: The % of 1 RM should be approximately 30–70%, not 25%.
- Leg extension: The contraction speed should be fast, not slow–moderate.
- Leg extension and squat: The rest time for both exercises should be 2–3 minutes, not 1 minute.
- Box jump with dumbbells: The reps range should be approximately 3–12 reps, not 20.

3 marks

1 mark for each error identified and rectified (two required).

1 mark for using data to support the response.

- c. Muscle fibre type:** Fast twitch fibres are capable of producing greater strength and power than slow twitch fibres. 1 mark

Therefore, a greater percentage of fast twitch fibres will increase speed, power and force production. 1 mark

Muscle cross-sectional area: The larger the muscle, the greater the speed, power and force production potential. 2 marks

- d.** *Any two of:*

- muscle hypertrophy
- increased muscular stores of ATP and CP
- increase in ATPase and creatine kinase enzymes
- increased glycolytic capacity
- increase in the number of motor units recruited
- increased lactate tolerance

2 marks

1 mark for identifying each chronic muscular adaptation (two required).

e. *Any one of:*

- Muscle hypertrophy: Increased size and number of myofibrils and increased amounts of myosin and actin filaments allows for greater contraction speed, force and power.
- Increased muscular stores of ATP and CP: This allows for longer contribution from the ATP–CP energy system that can resynthesise at a rapid rate for high intensity activities.
- Increase in ATPase and creatine kinase enzymes: These enzymes can break down ATP and CP at a faster rate, allowing for greater energy release and faster restoration of ATP.
- Increased glycolytic capacity: This allows for greater contributions from the anaerobic glycolysis system, which can also resynthesise ATP at a rapid rate and consequently produce more energy for high-intensity activities.
- Increased number of motor units recruited: The greater the number of motor units recruited, the greater the strength and power that can be produced by a muscle.
- Increased lactate tolerance: This prevents the onset of fatigue and allows an athlete to continue to generate ATP anaerobically (at a faster rate) and work at a higher intensity.

1 mark

1 mark for outlining how the selected chronic muscular adaptation would improve Lawson's performance as a track cyclist.

*Note: Consequential on answer to **Question 9d**.*

Question 10 (13 marks)

a. *Any two of:*

- aerobic power: length of match (42 minutes), total time spent above 75% HR max. (24 minutes)
- anaerobic capacity: total time spent above 85% HR max. (12 minutes)
- speed: total number of sprints (0–5 metres) (56)
- muscular power: total number of forehand smashes (17), total number of backhand drives (14), total number of forehand drives (78), total number of jumps (32)
- flexibility: total number of lunges (49)
- coordination: total number of forehand smashes (17), total number of backhand drives (14), total number of forehand drives (78), total number of jumps (32)
- muscular endurance: leg strength in completing 42 minutes of badminton

4 marks

For each fitness component:

1 mark for identifying the fitness component.

1 mark for using data to justify the fitness component.

- b.** *Based on answers given in **part a.**, any one standardised field-based test from any two of the following:*
- aerobic power:
 - multi-stage fitness test (20 m shuttle run test)
 - Yo-Yo intermittent recovery test
 - Cooper’s 12-minute run
 - Harvard step test
 - 2.4 km run test
 - Rockport 1.6 kilometre walking test
 - anaerobic capacity:
 - phosphate recovery test
 - speed:
 - 20-metre sprint test
 - 35-metre sprint test
 - 50-metre sprint test
 - muscular power:
 - seated basketball throw
 - standing long jump test
 - vertical jump test
 - the Margaria-Kalamen staircase test
 - flexibility:
 - trunk flexion test (sit-and-reach test)
 - trunk rotation test
 - groin flexibility test
 - shoulder and wrist elevation test
 - trunk and neck extension test
 - ankle extension/dorsiflexion test
 - shoulder rotation test
 - muscular endurance:
 - partial curl-ups
 - timed sit-ups
 - timed push-ups
 - pull-up test
 - flexed-arm hang test
 - 30-second endurance jump
 - multi-stage hurdle jump test

2 marks

*1 mark for naming an appropriate standardised field-based test for each of the fitness components identified in **Question 10a.** (two required).*

Note: Responses should not include standardised field-based tests for the ‘coordination’ fitness component.

c. *For example:*

Standardised field-based test: Yo-Yo intermittent recovery test

Physiological: The Yo-Yo intermittent recovery test mimics the physiological movements of badminton. For example, the periods of work and short rest during the test are specific to the intermittent nature of play and the break between points in badminton.

1 mark

Psychological: As Kaj is a state-level player, the motivation required to complete an exhaustive test such as the Yo-Yo intermittent recovery test will not be a concern, compared to an amateur athlete.

1 mark

Sociocultural: As the Yo-Yo intermittent recovery test is a field-based test, it is more accessible in terms of resources (cost) and facilities than a laboratory-based test.

1 mark

Note: Consequential on answer to Question 10b.

d. *For example:*

Kaj could use a training diary to monitor his training.

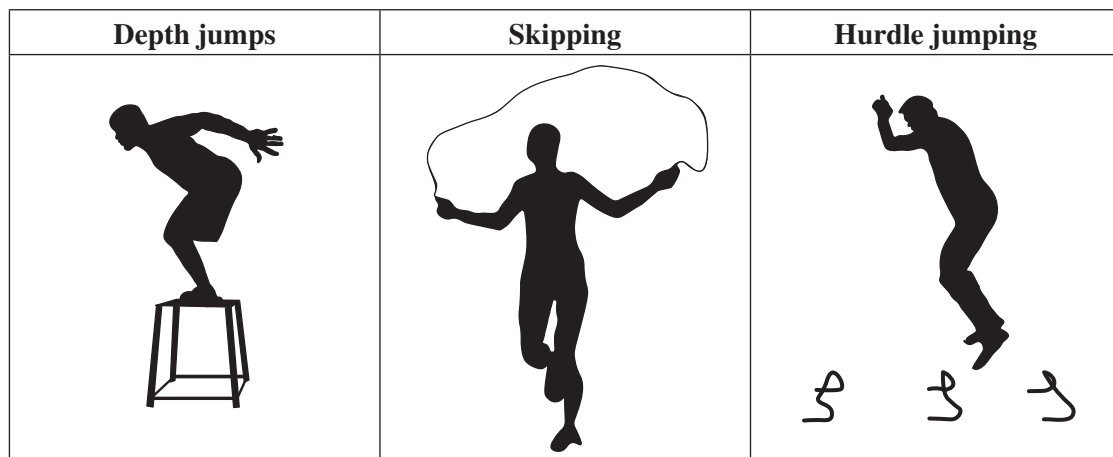
1 mark

Note: Responses could also include a training log, phone application, smart watch or heart rate monitor.

e. *Any two of:*

- Bounds: Kaj would move from one leg to another over a distance.
- Depth jumps: Kaj would step off a box and perform a quick, explosive jump up.
- Squat jumps: Kaj would squat down and then jump explosively.
- Box jumps: Kaj would jump explosively onto a box before stepping or jumping off.
- Quick stepping: Kaj would step with very fast movements quickly through a ladder that is laid on the ground.
- Skipping: Kaj would jump quickly over a rope.
- Hurdle jumping: Kaj would jump or bound over low or high hurdles.

For example, based on the exercises identified above, any of the following diagrams may be given:



2 marks

1 mark for describing an appropriate plyometric exercise (two required).

Note: Responses are not required to include a diagram but may do so to illustrate the description.

f. *Any one of:*

- reassessing goals, such as setting achievable goals or adding a reward
- practicing psychological techniques, such as playing energising music during a workout
- adding variety in his training

1 mark

1 mark for identifying an appropriate psychological strategy.

Question 11 (4 marks)

a. Ventilation is the amount of air inspired and expired per minute. 1 mark

$V = RF \times TV$ (ventilation equals respiratory frequency multiplied by tidal volume) 1 mark

b. There is a linear relationship between ventilation and oxygen consumption; as one increases, so does the other until it reaches a threshold. 1 mark

As an individual begins exercise, there is an increase in ventilation and oxygen demand, which is required for increased energy production. 1 mark