

## 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 checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
3	<input type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/> C	<input type="checkbox"/> D
4	<input type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input checked="" type="checkbox"/> D
5	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
6	<input checked="" type="checkbox"/> A	<input type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
7	<input type="checkbox"/> A	<input checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D
8	<input type="checkbox"/> A	<input type="checkbox"/> B	<input checked="" type="checkbox"/> C	<input 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 type="checkbox"/> B	<input checked="" 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 checked="" type="checkbox"/> B	<input type="checkbox"/> C	<input type="checkbox"/> D

**Question 1 B**

**B** is correct. The associative stage of learning is often referred to as the 'intermediate phase', and involves an individual having moved on from the early associative stage of learning and being able to identify and correct their own errors. **A** and **D** are incorrect. Rapid improvement and inconsistent performance are characteristic of the early associative stage of learning. **C** is incorrect. The autonomous stage of learning involves being able to perform skills 'automatically'.

**Question 2 A**

**A** is correct. Intrinsic feedback occurs when an individual uses their own senses to judge their performance, as in the case of a tennis player feeling impact in the racquet as it hits a tennis ball. **B** is incorrect. Extrinsic feedback is provided by an external source such as a coach, teammate or other observer. **C** is incorrect. Augmented feedback is another term for extrinsic feedback. **D** is incorrect. The player receives terminal feedback after the skill is performed, as opposed to when it is occurring.

**Question 3 C**

**C** is correct. As a surfer will be competing in the ocean, which is a highly variable and unpredictable environment, they are performing an open skill. **A** and **D** are incorrect. While soccer and basketball are sports typically characterised by the unpredictability of opponents and other competitors, the examples listed above (the penalty kick and the free throw) are performed in closed conditions. **B** is incorrect. Darts is a sport performed in closed conditions, so this is not an open skill.

**Question 4 D**

**D** is correct. At rest, the body is able to take up a large amount of oxygen, thus allowing for the breakdown of fats, which are stored as triglycerides in the body. **A** is incorrect. Phosphocreatine is a chemical fuel used in short periods of high-intensity activity. **B** is incorrect. While carbohydrates are a predominant source of fuel during exercise, fats are the preferred source while at rest. **C** is incorrect. Proteins are used as an energy source in extreme circumstances.

**Question 5 A**

**A** is correct. The lactate inflection point (LIP) is the last point at which lactate entry into and removal from the blood are balanced. After this point, lactate entry into the blood exceeds removal. **B** is incorrect. The utilisation of lactate to produce glucose is the process of gluconeogenesis. **C** and **D** are incorrect. Increased lactate tolerance is the ability to continue working at a high intensity despite the accumulation and build-up of lactate, as well as the associated fatigue.

**Question 6 A**

**A** is correct. A football player focused on observing other players is concentrating in a broad-external manner, as they are focused on the actions of others. When they shift to mentally rehearsing their upcoming movements, they are shifting to a narrow-internal type of concentration. **B**, **C** and **D** are incorrect. These options do not accurately describe the football player's shifting concentration.

**Question 7 B**

**B** is correct. Oxygen deficit is defined as an athlete having a level of oxygen which is less than the demand required of the physical activity they are engaged in. **A**, **C** and **D** are incorrect. These options do not describe oxygen deficit.

**Question 8 C**

**C** is correct. Cardiac output is defined as the stroke volume multiplied by the heart rate. Therefore, an increase in stroke volume or heart rate will thus increase their cardiac output. **A** is incorrect. An increase, not decrease, in venous return will increase cardiac output. **B** is incorrect. If the athlete's stroke volume were decreased, their cardiac output would also decrease. **D** is incorrect. Lung volume, a respiratory component, does not affect cardiac output.

**Question 9 D**

**D** is correct. The 20 m shuttle run test, also known as the multi-stage fitness test or 'beep test', is a field test that is used to measure aerobic power. Other tests used to measure and assess aerobic power are the Cooper's 12-minute run, 1.6 km run and Yo-Yo intermittent recovery test. **A** is incorrect. The body mass index, or BMI, is not a fitness test. **B** is incorrect. The phosphate recovery test measures anaerobic capacity as opposed to aerobic power. **C** is incorrect. The sprint test measures speed as opposed to aerobic power.

**Question 10 C**

**C** is correct. An increase in left ventricle size occurs as a result of consistent aerobic training. This is a chronic cardiovascular adaptation that results in increased stroke volume and increased cardiac output, and allows an increased amount of blood, and consequently oxygen, to be delivered to the working muscles. **A** is incorrect. A decreased, not increased, resting heart rate is also characteristic of such consistent aerobic training. **B** is incorrect. An increase in maximum ventilation is a long-term respiratory adaptation that may result from aerobic training, not a chronic cardiovascular adaptation. **D** is incorrect. Increased levels of ATPases is a muscular adaptation that occurs as a result of consistent anaerobic training.

**Question 11 C**

**C** is correct. An overarm throw is an example of a third-class lever. This is because the force is located between the axis and the resistance. **A** is incorrect. In a first-class lever, the axis is located between the force and the resistance. **B** is incorrect. In a second-class lever, the resistance is located between the axis and the force. **D** is incorrect. The question does employ an example of a lever system.

**Question 12 A**

**A** is correct. Acute responses occur for a short period of time during, and for a few minutes immediately after, exercise. Increased blood pressure is an acute cardiovascular response to intense physical activity. **B** is incorrect. Increased venous return is an acute cardiovascular response. **C** is incorrect. Increased motor unit recruitment is an acute muscular response. **D** is incorrect. Increased cardiac output is an acute cardiovascular response.

**Question 13 A**

**A** is correct. A 400 m race employs the anaerobic glycolysis system as the predominant supplier of energy. Due to insufficient oxygen during this race, glucose is broken down into pyruvic acid and subsequently lactic acid. A by-product of the breakdown of pyruvic acid are  $H^+$  ions, which accumulate in the muscles and cause them to become more acidic and fatigued. **B** is incorrect. While depletion of phosphocreatine may contribute to fatigue, it is more likely that the accumulation of  $H^+$  ions contributes to fatigue in a 400 m race. **C** and **D** are incorrect. Neither increased body temperature and excess sweating nor the depletion of triglyceride stores would be expected to take place during an event with a short duration, such as a 400 m race.

**Question 14 D**

**D** is correct. A higher LIP would be beneficial for an athlete participating in a 3 km race, as it would delay reliance on the anaerobic energy system for a longer period of time, thus delaying metabolic by-products from hindering the athlete's performance and allowing the athlete to sustain a faster speed for a longer period of time. **A**, **B** and **C** are incorrect. A higher LIP would not be useful for an athlete competing in activities that only require the aerobic energy system, including gymnastics, shorter running races and tennis.

**Question 15 B**

**B** is correct. Second-class levers have a mechanical advantage of greater than one. This is because the force arm of a second-class lever is longer than the resistance arm and, consequently, the mechanical advantage will be greater than one. **A** is incorrect. Third-class levers have the force between the axis and resistance. **C** is incorrect. First-class levers may have a mechanical advantage of greater than, less than or equal to one. **D** is incorrect. The force arm is calculated as the horizontal distance from the force to the axis.

**SECTION B****Question 1** (8 marks)

a. *For example, any one of:*

- Familial relations and dynamics may have been an influencing sociocultural factor; with two siblings who also play the sport, it is likely that her family would have encouraged her to participate in the sport.
- Emma's two older brothers, who are also soccer players, may have served as positive role models that allowed her to develop a passion for the sport.
- As Emma is an elite/professional soccer player, she is able to spend many hours throughout the week practicing and refining her skills, consequently impacting her skill development by allowing her to improve to the autonomous level that she is currently at.

3 marks

*1 mark for identification of a sociocultural factor.*

*2 marks for discussion of the sociocultural factor.*

*Note: Any reasonable sociocultural factor is acceptable.*

b. Based on the results from the table, Emma would have needed to work on improving her muscular endurance levels as her timed sit-ups score is below average. 1 mark

Emma would have needed to improve her cardiovascular endurance as her sprint test time is below average. 1 mark

Emma would have also needed to improve her muscular strength as she received a poor grade for her 1 RM leg press. 1 mark

c. Massed practice typically consists of weekly or fortnightly practice sessions that, due to infrequency, may go for many hours. 1 mark

*For example, any one of:*

- Massed practice is conducted in overly lengthy sessions.
- Massed practice is not conducted with frequent sessions.
- Massed practice includes few, if any, rest periods.

1 mark

*Note: Any reasonable disadvantage is acceptable.*

**Question 2** (4 marks)

A longer and heavier bat would result in an increased radius of rotation, due to the increased length. 1 mark

As linear velocity is equal to the angular velocity  $\times$  the radius of rotation, a longer, heavier bat will increase the linear velocity of a baseball struck by the bat. 1 mark

A longer, heavier bat will have a larger moment of inertia, which will make it more difficult for a younger and less physically strong player to swing the bat. 1 mark

A longer bat may also reduce the angular velocity of the swing if the player is not comfortable with a bat of that size, which would reduce the linear velocity of a baseball hit by the swing. 1 mark

**Question 3** (6 marks)**a. i.** *Any one of:*

- muscular power
- muscular endurance

1 mark

**ii.** *Any one of:*

- Muscular power: As Dayna has two weekly sessions that target muscular power (burpees and box jump) and has adequate rest periods, she is able to effectively maintain her muscular power levels.
- Muscular endurance: Dayna is able to efficiently maintain her current muscular endurance levels as she partakes in two resistance training sessions, consisting of 3 sets of 15 reps at 50% of 1 repetition maximum.

2 marks

*1 mark for identification of necessary number of repetitions/sets in order to maintain fitness level.*

*1 mark for naming relevant sessions.*

*Note: Responses should relate to answer given in **Question 3a.i**.*

**b.** aerobic power

1 mark

**c.** *Any one of:*

- Dayna could introduce more variability to increase her motivation levels. There is a lot of activities repetition, which could lead to boredom or loss of motivation to continue.
- Dayna should ensure her Friday continuous training session is performed between 70–85% max heart rate. She has incorrectly implemented 90% max heart rate, which does not effectively target aerobic power.

2 marks

*1 mark for identification of improvement area.*

*1 mark for justification.*

**Question 4** (12 marks)**a.** performing an activity analysis **or** games analysis

1 mark

**b.**

Fitness component	Recognised fitness test
agility	<ul style="list-style-type: none"> <li>• SEMO agility test</li> <li>• Illinois agility test</li> </ul>
aerobic power	<i>Any one of:</i> <ul style="list-style-type: none"> <li>• <b>Yo-Yo intermittent recovery test</b></li> <li>• <b>1.6 km run test</b></li> <li>• <b>Cooper's 12-minute run</b></li> <li>• <b>VO<sub>2</sub> maximum test</b></li> <li>• <b>multi-stage fitness test</b></li> </ul>
body composition	<ul style="list-style-type: none"> <li>• body mass index</li> <li>• waist circumference</li> </ul>

3 marks

*1 mark for each correct response.*

c. *Any two of:*

- **Agility:** Jacqueline would need to be agile in order to weave around opponents to attain the ball and pass to teammates.
- **Coordination:** Jacqueline would need a high level of coordination in order to efficiently control her body as she manoeuvres with the ball.
- **Speed:** Jacqueline would need to be able to quickly move across the court in order to place herself in an optimal position to receive the ball from teammates or to intercept the ball.
- **Anaerobic capacity:** As netball is a game characterised by heavy reliance on the anaerobic glycolysis system, Jacqueline would need highly developed anaerobic capacity.

4 marks

*1 mark for each relevant fitness component identified.  
1 mark for each discussion of the fitness component within the scenario.*

d. *Any one of (agility):*

- **Reaction time:** A faster reaction time allows for increased movement from a stationary start, and consequently improves agility.
- **Cognitive ability:** Increased cognitive ability allows faster recognition and consequently faster reaction to a stimulus, enabling greater agility.

*Any one of (coordination):*

- **Practice:** Coordination can be improved by continuous practice of a particular movement skill. Over time, performance of the skill will become more developed and will become smoother.

*Any one of (speed):*

- **Muscle fibre type:** Fast-twitch muscle fibres contract faster than slow-twitch muscle fibres. Consequently, a higher proportion of fast-twitch muscle fibres as compared to slow-twitch muscle fibres would result in increased speed.
- **Number of muscle motor units recruited:** An increased number of muscle motor units being recruited results in increased muscular contraction force and consequently increased speed.

*Any one of (anaerobic capacity):*

- **Muscle fibre type:** Fast-twitch muscle fibres have a higher anaerobic capacity as compared to slow-twitch muscle fibres. Therefore, a higher proportion of fast-twitch muscle fibres would result in increased anaerobic capacity.
- **Gender:** Males typically have a greater muscle mass as compared to females, thus having a larger amount of fast-twitch muscle fibres and consequently greater anaerobic capacity.

4 marks

*1 mark for each factor identified.  
1 mark for each explanation of the factor within the scenario.  
Note: Responses should relate to the answer given in **Question 4c**.*

**Question 5** (4 marks)**a.** *Any two of:*

- increased lung volume
- increased tidal volume at submaximal and maximal levels
- increase in maximum ventilation
- increase in maximum oxygen consumption ( $\text{VO}_2 \text{ max}$ )
- increase in pulmonary diffusion

2 marks

**b.** *Any one of:*

- **Increased lung volume:** An increase in lung volume results in more air being inhaled by the lungs, allowing more oxygen to be diffused into the bloodstream and subsequently transported to the working muscles.
- **Increased tidal volume at submaximal and maximal levels:** During submaximal and maximal exercise, tidal volume, which is the amount of air that can be inhaled in one breath, increases, consequently increasing lung volume.
- **Increase in maximum ventilation:** An increase in maximum ventilation allows for an increased amount of air, and therefore oxygen, entering the lungs and diffusing into the bloodstream to be transported to the working muscles.
- **Increase in maximum oxygen consumption ( $\text{VO}_2 \text{ max}$ ):**  $\text{VO}_2 \text{ max}$  is the maximum amount of oxygen that can be consumed in one minute. An increased  $\text{VO}_2 \text{ max}$  will allow more oxygen to be taken up by the lungs, diffused into the bloodstream and taken to the working muscles to make energy aerobically.
- **Increase in pulmonary diffusion:** Pulmonary diffusion involves oxygen moving from the alveoli in the lungs to the capillaries and the movement of carbon dioxide from the bloodstream to the alveoli where it is subsequently exhaled out. Increased pulmonary diffusion involves a more efficient exchange of gases.

1 mark

This allows increased production of ATP aerobically, thus reducing reliance on the anaerobic systems and consequently reducing production of metabolic by-products.

1 mark

*Note: Responses should relate to the answer given in **Question 5a**.*

**Question 6** (7 marks)**a.** observation

1 mark

evaluation

1 mark

**b.** *Any two of:*

- to predict future performance levels
- to scout new athletic talent or potential
- to identify athletes' strengths and weaknesses

2 marks



**c.** *Any three of:*

- ensuring that valid and reliable testing methods are being implemented during the testing
- increasing the number of observers watching and evaluating the testing
- ensure consistency among observers by ensuring that all observers use standardised testing measures with clear criteria, such as checklists and/or rating scales
- taking the average of observers' scores and eliminating any clear outliers which do not correlate with the data

3 marks

**Question 7 (13 marks)**

- a.** It is likely that Doug's angle of release of the ball is too great, 1 mark  
and he is not releasing the ball at the appropriate angle. 1 mark  
Another contribution factor may be that his speed of release is too fast. 1 mark  
In order to pitch the ball so that the batter will be able to hit it, Doug could try to match his angle of release with the appropriate angle. This would decrease the vertical component of his pitching and enable the trajectory of the projectile to better reach the batter. 1 mark  
Doug could also reduce his speed of release, as this would decrease the vertical velocity of the ball and cause it to fall before it reaches the batter, thus reaching the batter at a suitable height. 1 mark
- b.** Adele could modify the size of the baseball bats during the training session. 1 mark  
The smaller bats would have a smaller moment of inertia and would therefore be easier for the young players to rotate when batting. 1 mark  
She could also reduce the dimensions of the baseball field. 1 mark  
As the players are very young, they will likely have a smaller body size than adult players. Consequently, a reduced field size would make it easier for them to practice. 1 mark
- c.** Impulse is defined as the change in momentum of an object. It is equal to force  $\times$  time. 1 mark  
Wearing thick gloves to catch a ball will increase the time of collision between the ball and Sab's hands. 1 mark  
As impulse is equal to force  $\times$  time, the time of collision will be increased and consequently the force of the collision will be decreased. 1 mark  
Consequently, there will be a decreased force of the ball, and Sab is less likely to experience an injury. 1 mark

**Question 8** (9 marks)

All three energy systems contribute when Simon is competing in a 400 m running race; however, their contributions will vary depending on intensity and duration. 1 mark

The ATP–PC system will be dominant at the beginning of the race (the first 10–15 seconds) due to the ATP and phosphocreatine (PC) stored at the working muscles. 1 mark

However, the anaerobic glycolysis system will be the predominant supplier of ATP throughout the race due to the short duration, as this system is able to quickly replenish ATP without the use of oxygen. 1 mark

As the race is of a short duration (<1 minute), there is not adequate time for the aerobic glycolysis system to become the predominant supplier of energy. An extended period of time is required for the uptake and transport of oxygen, leading to the aerobic glycolysis becoming dominant after ~1 minute. 1 mark

When Simon increases the intensity of his performance, the anaerobic energy system increases its contribution to ATP production. 1 mark

As a result, more lactic acid will be produced by the anaerobic glycolysis system and will then be broken down into lactate and  $H^+$  ions. 1 mark

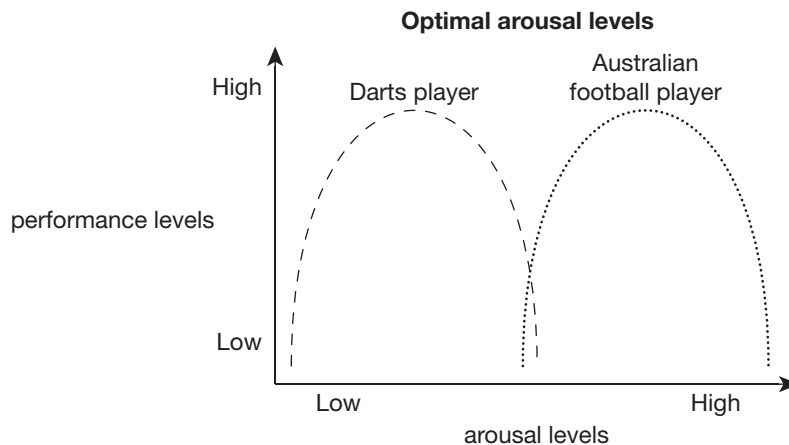
The main source of fatigue will be the accumulation of metabolic by-products such as  $H^+$  ions, which are associated with the build-up of lactic acid in the muscles. 1 mark

The  $H^+$  ions will accumulate in the muscles, causing them to become more acidic and contributing to Simon feeling fatigued. 1 mark

Due to such fatigue, it is expected that Simon’s performance will be adversely affected, and he may start to slow down once this has occurred. 1 mark

**Question 9** (8 marks)

a.



2 marks  
1 mark for each correct labelled graph.

b. Athletes may experience a lack of motivation, leading to decreased performance levels. 1 mark

Athletes may experience impaired concentration, leading to decreased performance levels. 1 mark

- c. *Any two of (increasing arousal):*
- increasing breathing rate
  - acting energetically
  - listening to upbeat music
  - positive mental imagery
- 2 marks

*Any two of (decreasing arousal):*

- reducing breathing rate
- progressive muscle relaxation
- meditation
- biofeedback

2 marks

**Question 10** (3 marks)

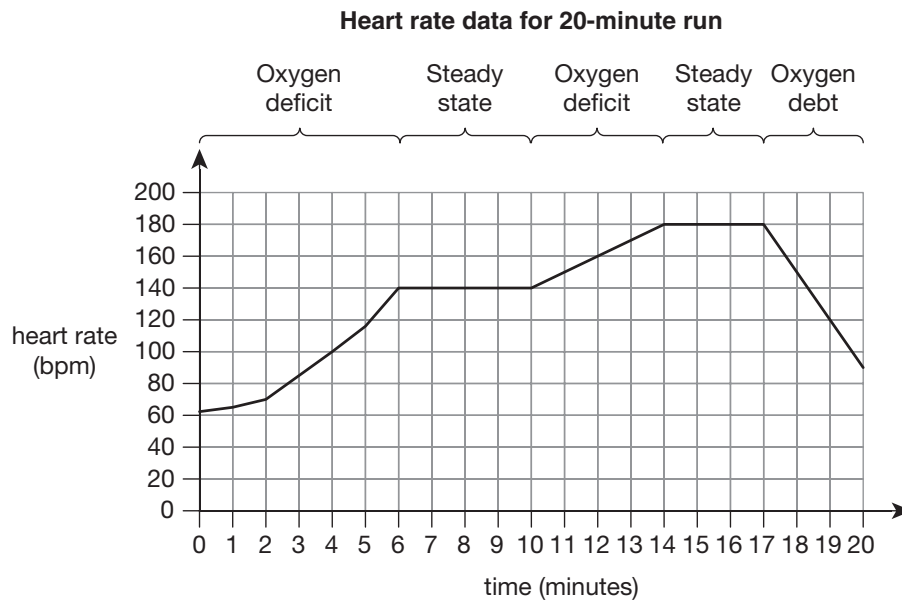
- a. cognitive stage of learning 1 mark
- b. massed practice (practices only a few times a week, but consisting of several hours) 1 mark  
 blocked practice (repetitively practicing the same drills over and over) 1 mark

**Question 11** (10 marks)

- a. All three energy systems contribute to Sue's ATP production throughout the badminton match. Their contributions vary depending on the intensity and duration of the activity. 1 mark  
 At the beginning of the match, her ATP-PC system will be the dominant energy provider as it is able to produce ATP at a rapid rate. 1 mark  
 As the match progresses, and Sue sprints across the court in order to reach the shuttlecock in time, her anaerobic glycolysis system will become dominant, due to the depletion of the PC stores. 1 mark  
 During breaks between games, Sue's PC stores will start to replenish, allowing increased reliance on the ATP-PC system for short bursts of activity. 1 mark  
 As the match lasts for roughly 135 minutes, the predominant supplier of ATP will be the aerobic glycolysis system. 1 mark
- b. *For example (knowledge of results):*  
 The shuttlecock hit the net. 1 mark  
*For example (knowledge of performance feedback):*  
 The angle with which the racquet hit the shuttlecock was too low. You need to increase the angle at which you hit the shuttlecock in order to make it over the net. 1 mark  
*Note: Award 1 mark for any reasonable knowledge of results or knowledge of performance feedback.*
- c. Knowledge of performance feedback or of results allows athletes to receive feedback about the techniques required to improve their skills in relation to a task. 1 mark  
 Consequently, the athlete will be able to recognise errors to make modifications to their performance and improve for next time. 1 mark

**Question 12** (9 marks)

a.



5 marks

*1 mark for each period correctly labelled.*

b. EPOC fast replenishment

1 mark

Fast replenishment takes approximately 3 minutes. During this time PC and ATP stores within the muscle are replenished.

1 mark

EPOC slow replenishment

1 mark

Metabolic by-products such as  $H^+$  ions are removed from the body. Core body temperature, heart rate and breathing rate return to pre-exercise levels.

1 mark

**Question 13** (4 marks)

a. When ballerinas apply rosin to their feet, they increase the friction of their feet with the surface of the floor, thus decreasing the likelihood of slipping.

1 mark

b. Newton's second law of motion states that force = mass  $\times$  acceleration.

1 mark

An increased body mass requires a greater force to accelerate it and thus disrupt its stability.

1 mark

c. *Any one of:*

- A dancer may increase their stability by adopting a wider stance and therefore increasing their base of support.
- A dancer may increase their stability by lowering their centre of gravity.

1 mark

**Question 14** (4 marks)

- a. Speed is defined as the distance over time  $\left(s = \frac{d}{t}\right)$ , whereas velocity is defined as displacement over time  $\left(v = \frac{d}{t}\right)$ . 1 mark
- Velocity is a vector, therefore it has a direction, whereas speed does not. 1 mark
- b. As the hockey puck is not accelerating, there are two possible options in regards to whether it is moving; that it is stationary 1 mark  
or that it is moving at a constant velocity. 1 mark

**Question 15** (4 marks)

- a. Intrinsic feedback is when an athlete uses their own internal senses to evaluate their performance. 1 mark  
An example of this is Gaya 'feeling' the golf club squarely hit the golf ball. 1 mark
- b. Gaya is motivated by an intrinsic form of motivation because she is striving to achieve a personal goal. 1 mark  
Extrinsic motivation involves an athlete being motivated by an outside factor, such as a monetary award, trophies or external obligations. 1 mark