PHYSICAL EDUCATION STUDIES

12 ATAR Course Examination 2024

Marking Key

Section One: Multiple-choice 20% (20 marks)

Question	Answer
1	D
2	B
3	B
4	D
5	C
6	D
7	A
8	C
9	C
10	A
11	C
12	D
13	A
14	C
15	B
16	D
17	B
18	C
19	C
20	D

Section Two: Short answer 50% (80 marks)

Question 21 (13 marks)

(a) Outline **three** ways Harley could maintain his balance when executing a fend off.

(3 marks)

Description	Marks
For each (3 x 1 mark)	
Outlines how balance could be maintained	1
Total	**3**

- Widen the base of support
  - Harley can stand with feet spread wide apart
- Increase points of contact with the ground/increase surface area to the ground
  - Harley can stand flat footed or can ensure he has two feet firmly on the ground when fending off
- Lower the centre of gravity
  - Harley can bend his knees
- Move the line of gravity towards the oncoming force in base of support
  - Harley moves his weight towards the opponent

(b) When Harley practises his fend-offs at training, his midfield coach often holds a tackle bag. Identify the biomechanical principle behind this and explain the benefit to the coach.

(3 Marks)

Description	Marks
Identifies the principle of impulse	1
Subtotal	**1**
Explanation of the benefit to the coach	1-2
• The tackle bag increases the time in which the force is absorbed • The peak force applied to the coach is reduced resulting in reduced chance of injury to the coach/player	
Subtotal	**2**
Total	**3**
Accept other relevant answers	

(c) Name and describe the training activity that Harley's coach is using in (b) with the tackle bag and identify the category of transfer of learning that is occurring.

(4 marks)

Description	Marks
Names shaping as the training activity	1
Subtotal	**1**
Clear description of the concept of shaping with all relevant information	2
Simple description of the concept of shaping with some information	1
Shaping involves learning a simplified/incomplete version of a skill and adding the missing parts as the skill is developed	
Subtotal	**2**
Identifies Training to Competition as the transfer of learning category	1
Subtotal	**1**
Total	**4**
Accept other relevant answers	

(d) Some say Harley has gained more media attention than any other first year player in the history of the AFL. The television cameras appear to spend a disproportionate amount of time on him compared to the other players. Outline **three** benefits of video analysis that Harley could utilise to improve. (3 marks)

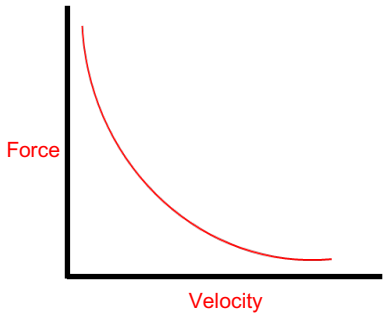
Description	Marks
For each (3 x 1 mark)	
Outlines benefits of video analysis	1
Total	**3**
Answers could include: • compare his performance side-by-side with an exemplar • replay footage to revisit anything he missed on the first viewing • store this footage and use it to track progress • view this footage at training and make the corrections immediately • be more involved with detecting and correcting his own errors • zoom in on the video to pick up greater detail • slow the video down making it easier to notice errors	
Accept other relevant answers	

Question 22 **(12 marks)**

(a) Other than a hyperbaric chamber, name **two** other physiological recovery strategies Stoltman could use during his training program and outline how they can benefit him. (4 marks)

Description	Marks
For each strategy (2 x 1 mark)	
Names a physiological recovery strategy	1
Outlines how the strategy can benefit Stoltman	1
Answers include any two of: • Massage – helps increase blood flow and assist in the removal of waste by-products • Hyperbaric chamber – increases oxygen concentration in blood • Compression garments – increases blood flow to muscles and assist in the removal of waste by-products/prevents venous pooling • Active recovery for cool down/stretching - removes waste by-products • Contrast therapy – hot/cold temperatures increase blood flow and waste by-product removal • Nutrition – protein to repair muscles • Rest/Sleep – allows body to repair cells	
Total	**4**
Accept other relevant answers	

(b) Draw and label a graph of the force-velocity relationship for muscle contraction and explain how Stoltman may have applied it in this lift. (4 marks)



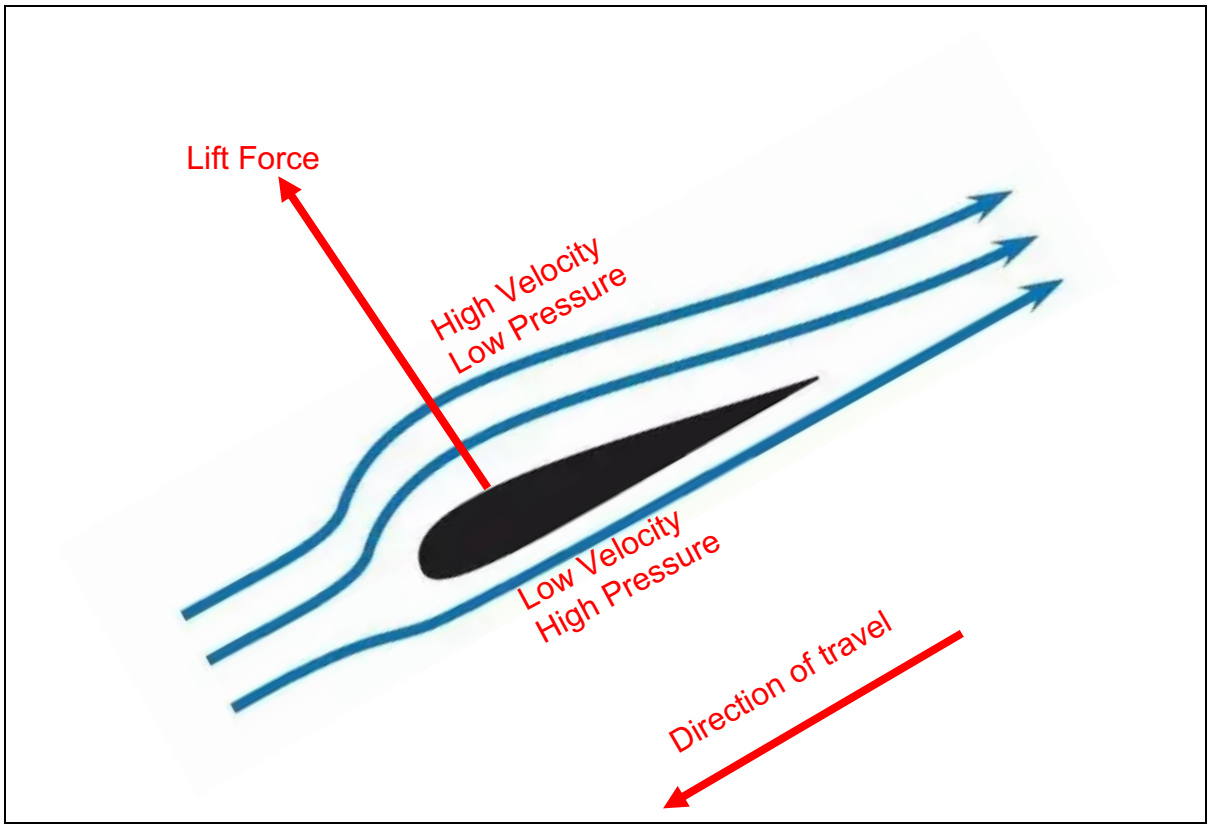
Description	Marks
Correctly draws and labels the axes on the graph	1
Subtotal	**1**
Explains how Stoltman may have applied the concept in this lift	1-3
• The amount of force produced depends on the velocity of the muscle contraction • Stoltman would lift the stones slowly to produce maximum force • Slower velocity contractions form more actin-myosin cross bridges	
Subtotal	**3**
Total	**4**
Accept other relevant answers	

(c) Compare **two** differences in motor unit recruitment between Stoltman lifting the 100 kg stone compared to his record-breaking attempt of 273 kg. (4 marks)

Description	Marks
For each (2 x 2 marks)	
Comprehensive comparison of the two lifts with specific reference to each	2
Simple comparison of the two lifts with reference to one or the other	1
100kg attempt • activates small/medium sized motor units • activates small/medium number of motor units • recruits type I and type II a muscle fibres 273kg attempt • activates small, medium, and large sized motor units • activates all motor units • recruits type I, type II a, and II b muscle fibres	
Total	**4**
Accept other relevant answers	

Question 23 **(4 marks)**

With reference to Bernoulli's principle, complete the diagram of the airflow and biomechanics over the skydiver's arm. (4 marks)



Description	Marks
Correctly labels the diagram	1-4
• lift force: *must be perpendicular to the skydiver's arm – not vertical* • velocity • pressure • direction of travel	
Total	**4**
Accept other relevant answers	

Question 24 **(12 marks)**

(a) Discuss what a sarcomere would most likely look like in Harry's left tricep muscle at the exact moment in the picture above where his glove is connecting with his opponent. (4 marks)

Description	Marks
Discusses what a sarcomere would most likely look like	1-4
Discussion includes any **four** of: • myosin to attach to actin (myosin reaches out to actin binding sites) • myosin attached to actin filaments creating a cross bridge • muscle/sarcomere is shorter • H zone decreases • I band decreases	
Total	**4**
Accept other relevant answers	

(b) Name **two** mental skill strategies Harry could teach to aspiring boxers in his personal development seminars to boost their confidence before a boxing match and provide an example of how each could be applied. (4 marks)

Description	Marks
For each strategy (2 x 1 mark)	
Names the strategy	1
Provides an example of each strategy	1
Total	**4**
• Goal Setting: SMART goal to look the opponent in the eyes during the pre-game routine until they look away, boosting confidence • Imagery: visualise themselves, running into the ring and hearing the crowd cheering, boosting confidence • Performance Routines: walk into the ring, stomp the ground twice, 2 deep breaths, then visualise the opponent knocked out on the ground • Self-Talk: say 'light on my toes, I'm the champ' before the glove touch	
Accept other relevant answers	

(c) Harry is also known for his unusual training habits, completing ballet and army training which he says is critical to his success. Describe **two** ways in which these activities could improve Harry's boxing ability. (4 marks)

Description	Marks
For each (2 x 2 marks)	
Clearly describes the possible improvements with reference to the alternative activity	2
Simply describes the possible improvements with minimal connection to the alternative activity	1
Total	**4**

Any two of:

- A positive transfer of learning e.g. improved footwork from ballet or martial arts in the army transfers positively to boxing
- Both of these activities utilise the anaerobic energy system, meaning Harry will be fitter anaerobically for boxing
- Army training and ballet increase Harry's aerobic capacity meaning that he is able to last late into the round

Accept other relevant answers

Question 25 **(15 marks)**

(a) Identify and describe **two** methods of altitude training in relation to living and training circumstances for an athlete wanting to climb to Bluff Knoll's summit in a record time. (6 marks)

Description	Marks
For each (2 x 3 marks)	
Identifies the method	1
Subtotal	**2**
Clear description of the strategy with all relevant information	2
Simple description of the strategy with minimal supporting information	1
Subtotal	**4**
Total	**6**
• Living High, Training Low: daily exposure to low oxygen environments in order to receive adaptations, while training in oxygen rich environments to maximise training effect/intensity • Living High, Training High: living in a low oxygen environment in order to gain adaptations, whilst also training in low oxygen environments to prepare the athlete for competing in events at altitude	
Accept other relevant answers	

(b) Identify **three** adaptations to altitude training that an athlete may experience after completing altitude training and outline their benefit to performance. (6 marks)

Description	Marks
For each adaptation (3 x 2 marks)	
Identifies **the** adaptation	1
Outlines a benefit to performance	1
Total	**6**
Any two of: • Increased Haematocrit/red blood cells: increases the oxygen carrying capacity of blood • Increased Haemoglobin: responsible for transporting O_2 from the lungs to the muscles, therefore increasing the oxygen delivered to the lungs • Increased Number of Mitochondria: the powerhouse of the cell, and the site for ATP production • Increased Aerobic Enzymes: increase the rate at which ATP is produced from aerobic respiration • Increased Capillarisation: allows for greater surface area for diffusion of O_2 at the muscles and the lungs. • Increased Myoglobin: responsible for transporting O_2 molecules from the haemoglobin/blood to the mitochondria/muscle, therefore improving the rate of ATP production	
Accept other relevant answers	

(c) Temperatures at the top of Bluff Knoll can often be below freezing with regular accounts of snow at the peak. Outline **three** immediate effects of the cold a climber might experience at the summit of Bluff Knoll. (3 marks)

Description	Marks
For each (3 x 1 mark)	
Outlines **three** immediate effects of the cold	1
Total	**3**
• Peripheral Vasoconstriction: blood vessels close to the skin constrict, redirected blood away from the extremities and skin surface, towards the core, to minimise heat loss to the environment. • Shivering: involuntary muscular contractions occur to produce heat • Piloerection: hairs on the body stand on end in an attempt to trap warm air close to the skin.	
Accept other relevant answers	

Question 26 **(14 marks)**

(a) Justify which leadership style would most likely suit experienced and highly motivated athletes when choosing coaches for the newly formed AIS. (3 marks)

Description	Marks
Justifies 'Democratic' as the most appropriate leadership style	1-3
Total	**3**
Democratic is the best because the athletes are already highly motivated and athletes can use their experience to have input into decision making Or other appropriate justification	
Accept other relevant answers	

(b) For the coaching style above outline **two** characteristics of athletes for whom it would not be suitable (2 marks)

Description	Marks
For each characteristic (2 x 1 mark)	
Outlines a characteristic of athletes for whom it would not be suitable	1
Total	**2**
• Athletes who need direction • Athletes who are intensely focussed and don't want input from other team members • Athletes who value extrinsic motivation	
Accept other relevant answers	

(c) Identify **one** method in which coaches in the newly formed AIS could promote social cohesion amongst their athletes and explain why this would be important in a situation as that in the AIS. (4 marks)

Description	Marks
Identifies an appropriate method of improving group cohesion	1
Subtotal	**1**
Comprehensively explains why this would be important with specific reference to athletes coming from different areas and different backgrounds	3
Clearly explains why this would be important with some reference to athletes coming from different areas and different backgrounds	2
Simply explains why this would be important	1
Subtotal	**3**
Total	**4**
• Encourage social interactions within the institute • Assign informal roles to the team • Encourage and facilitate regular contact and involvement with friends and family • Encourage/promote informal routines	
Accept other relevant answers	

(d) With reference to a 3rd class lever, outline the mechanics of this type of lever, and explain how javelin throwers (with a greater average height) use these levers compared to weightlifters (with a shorter average height). (5 marks)

Description	Marks
Outlines the mechanics of a 3rd class lever	1
Subtotal	**1**
For each (2 x 2 marks)	
Clear explanation of how a 3rd class lever assist each of the different athletes with specific reference to the type of actions required	2
Simple explanation of how a 3rd class lever assist each of the different athletes with minimal reference to the type of actions required	1
Subtotal	**4**
Total	**5**
A 3rd class lever has the force/effort in the middle and the resistance/load and fulcrum/axis on either side • A taller javelin thrower will have a longer resistance arm relative to the effort arm due to longer limbs. This creates a higher velocity of movement therefore throwing a javelin further • The shorter weightlifter will have a shorter resistance arm relative to the effort arm due to shorter limbs. This creates more torque therefore lifting a heavier weight	
Accept other relevant answers	

Question 27 **(4 marks)**

Explain **two** reasons why golf balls are hit further in higher temperatures. (4 marks)

Description	Marks
For each reason (2 x 2 marks)	
Clear explanation of why a golf ball will travel further in warmer conditions with all relevant detail	2
Simple explanation of why a golf ball will travel further in warmer conditions with some detail	1
Total	**4**
Answers could include: • The higher temperature of the ball increases the Coefficient of Restitution making it more elastic, conserving more energy/momentum • High temperatures decrease the air density meaning the golf ball doesn't have as much resistance when travelling through the air and can go further	
Accept other relevant answers	

Question 28 **(6 marks)**

Identify an objective and outline **two** characteristics of the pre-season and in-season for the Geelong Cats that Chris may have planned for.

Description	Marks
For each phase (2 x 3 marks)	
Identifies an objective	1
Subtotal	**2**
Outlines **two** characteristics	1-2
Subtotal	**4**
Total	**6**

Answers could include:

Pre season

- Objective: to build a suitable aerobic base and skill level leading into the competition.
- Characteristics
  - High volume training with low/medium levels of intensity
  - Continuous, interval, fartlek, flexibility training
  - Fitness testing used to gather baseline data and compare to other players, teams, previous seasons etc.
  - Develop game specific fitness, skills and strategies.
  - Training may need to be personalised depending on players/positional needs.
  - Appropriate mental skills are developed.

In-season

- Objective: to reach peak match condition.
- Characteristics
  - Focus at training moves to match specific intensities, durations & tactics.
  - Application of the principle of specificity is crucial.
  - Intensity of training increases and volume of training decreases.
  - Play trial games/scratch matches.
  - Fitness is maintained, dependent on individual situations (injury and illness, position, number of games played, game time played etc.).
  - Focus on psychological and tactical preparation.
  - Recovery sessions critical, particularly after games when players are often sore.
  - Constant peaking and tapering are critical in allowing players sufficient recovery during the season.

Accept other relevant answers

Section Three: Extended answer 30% (30 Marks)

Question 29 **(15 marks)**

(a) Identify which muscle fibre type Jeff and Rachel are most likely to possess and compare **four** characteristics of this muscle fibre that enhance their performance compared another muscle fibre. (9 marks)

Description	Marks
Identifies type IIa as the predominant muscle fibre type	1
Subtotal	**1**
For each characteristic (4 x 2 marks)	
Thorough comparison of the characteristic identified with a clear link between the two.	2
Simple comparison of the characteristic identified with a basic link between the two.	1
Subtotal	**8**
Total	**9**

• Moderate-fast/fast contraction speed ▪ This allows Jeff and Rachel to produce greater power in his dance moves
• High force production ▪ This allows Jeff and Rachel to produce greater power in his dance moves
• Moderate-large/large muscle fibre size ▪ This allows Jeff and Rachel to produce greater muscle force and power in his dance moves
• Medium resistance to fatigue ▪ This allows them to last 60 seconds before becoming too fatigued
• Medium/intermediate mitochondrial density ▪ Allows enough ATP production to last 60 seconds before fatigue
Accept other relevant answers

(b) Describe how a performer could apply each of **three** biomechanical concepts to control how fast they were spinning. (6 marks)

Description	Marks
For each (3 x 2 marks)	
Clear description of the application of the concept with all relevant information	2
Simple description of the application of the concept with some information	1
Total	**6**
Moment of Inertia • The breaker can reduce their moment of inertia by tucking their arms and legs in close to the axis of rotation Or • The breaker can increase their moment of inertia by extending their arms and legs further away from the axis of rotation	
Angular Velocity • The breaker can increase their angular velocity by tucking their arms and legs in close to the axis of rotation Or • The breaker can decrease their angular velocity by extending their arms and legs away from the axis of rotation	
Angular Momentum • The angular momentum will stay the same throughout the whole spin Or • The angular momentum will decrease slightly throughout the spin due to frictional forces and air resistance	
Accept other relevant answers	

Question 30 **(15 marks)**

Define 'arousal' and describe how the goalkeeper Mackenzie Arnold might be feeling. Identify **four** strategies that may be used to manage her arousal level and explain how these would benefit her in preparation for the penalties. (15 marks)

Description	Marks
Defines the term 'arousal'	1
Subtotal	**1**
Arousal: the degree of stimulation or alertness present in a performer about to perform a skilled task	
Clear description of how the goalkeeper Mackenzie Arnold might be feeling in relation to her level of arousal	2
Simple description of how the goalkeeper Mackenzie Arnold might be feeling with some reference to her level of arousal	1
Subtotal	**2**
Mackenzie is likely over aroused in the penalty shootout given the importance of the situation.	
For each (4 x 1 mark)	
Identifies a strategy that Mackenzie Arnold could use	1
Subtotal	**4**
For each (4 x 2 marks)	
Clear explanation of how these may benefit Mackenzie Arnold in preparation for the penalties	2
Simple explanation of how these may benefit Mackenzie Arnold	1
Subtotal	**8**
Total	**15**
• Relaxation ▪ This reduces arousal by minimizing the physical effects on Mackenzie e.g. muscle tension, increased heart rate	
• Imagery ▪ Imagery can reduce arousal because Mackenzie can recreate success or a calming scene in her mind's eye	
• Performance Routines ▪ A performance routine can reduce Mackenzie's arousal by including relaxing elements and directing her attention to the task rather than irrelevant arousal raising cues/thoughts	
• Self-Talk ▪ Self-talk can reduce arousal by reassuring Mackenzie and blocking out negative thoughts	
Accept other relevant answers	

Question 31 **(15 marks)**

Identify **one** physiological side effect for each of the performance enhancers listed below and explain how each could potentially benefit a swimmer.

- caffeine
- protein powder
- erythropoietin (EPO)
- creatine
- anabolic steroids

Description	Marks
For each (5 x 3 mark)s	
Identifies a physiological side effect for each performance enhancer	1
Subtotal	**5**
Clear explanation of how these could benefit a swimmer with all relevant information	2
Simple explanation of how these could benefit a swimmer with some information	1
Subtotal	**10**
Total	**15**

Caffeine

Side-effect

- increased heart rate/cardiovascular activity
- Potent diuretic
- increased muscle shakes/tremors

Benefit

- Acts as an analgesic, reduces the perception of effort, masks fatigue and therefore increases the time to exhaustion
- Stimulates the Central Nervous System, increasing alertness and improving reaction times.

Create a glycogen sparing effect through the oxidation of free fatty acids. Through the metabolism of fat, the athlete can spare glycogen use, improving performance in long duration events

Protein Powder

Side-effect

- May increase the chance of osteoporosis
- May increase the chance of colonic cancers
- May increase the chance of impaired kidney function
- Increase water retention.

Benefit

- Increased muscle growth (hypertrophy)
- Increased repair of damaged tissue.
- Decrease muscle catabolism (breaking down of muscle tissue) using protein as a fuel source.

Improve the rate of recovery from training sessions

EPO

Side-effect

- The increased number of RBC's thickens the blood and increases the chances of blood clots
- Strokes and heart failure.

Benefit

- Injecting the hormone increases the rate of manufacture of RBC's, which increases the oxygen carrying capacity in the blood stream, improving VO2 max

Creatine

Side-effect

- Some athletes report feelings of cramping and gastrointestinal pain.
- May reduce the body's own ability to make creatine, leading to dependence
- Increases the storage of water in the muscle – associated with rapid weight gain

Benefit

- Improves ATP and PCr resynthesis in recovery – this improves the athlete's ability to produce repeated efforts leading to increased training benefits
  Increase in PCr stores in muscle means the ATP/PC system can work for longer before anaerobic glycolysis takes over as the dominant energy system. This delays the onset of muscle inhibiting hydrogen ions

Anabolic Steroids

Side-effect

- Deepening of the voice
- Breast atrophy (decrease in breast size)
- Alopecia/hair loss/baldness
- Abnormal menstrual cycles/amenorrhea/infertility (females)
- Acne
- Liver disease/cancer/dysfunction/damage
- Kidney disease/malfunction/difficulty urinating
- Raised cholesterol
- Cardiovascular risks including hypertension (high blood pressure)/heart attack/stroke

Benefit

- Increase the performer's size, strength & power
- Decreases recovery time
- Stimulates protein synthesis
  Improved rate of tissue repair

Accept other relevant answers

Question 32 **(15 marks)**

(a) Discuss how Kate may prepare nutritionally for each phase: 1-day before; during; and immediately after the race so that she can perform at her peak, by including **three** nutritional strategies for each phase. (9 marks)

Description	Marks
For each phase (3 x 3 marks)	
Identifies **three** nutritional strategies that Kate Baker could use to prepare	1-3
Total	**9**
1-day before Race • Carbohydrate loading 8 – 10 g of carbohydrate per kg of body mass maximises athletes muscle glycogen stores prior to race. (As part of a 3-day carbohydrate load) • Carbohydrate loading is used in conjunction with tapering so maximal glycogen stores are maintained • Low GI foods/carbohydrate are used to carbohydrate load because they release glucose slowly into the blood stream avoiding rebound hypoglycaemia • Appropriate example of a low GI, high carbohydrate food e.g. pasta	
During • 30-60 g of CHO per hour to release additional blood glucose and spare glycogen. • Carbohydrate should be High GI for rapid release of glucose and absorption into the bloodstream/ delaying the use of stored glycogen. • Avoid high fibre foods and/or avoid high fat foods (easily digestible) due to causing gastrointestinal upset and energy loss through digestion. • Ingest electrolytes as they replace minerals / salts lost during the race via sweating. • 200ml of water every 15 minutes to delay dehydration • Appropriate high GI example e.g., sports gel, lolly snakes, etc	
Immediately After • High GI CHO within 30 minutes of race concluding as muscles most responsive and aid muscle recovery by replenishing glycogen stores. • Ingest electrolytes to replace essential minerals lost during sweating and assist recovery before next game. • Consume high protein meals to assist with muscle tissue repair. • Appropriate example that is either high GI or high protein e.g. lollies, choc milk • Consume water equivalent to 1.5x fluid lost to replace fluid lost during sweating and assist recovery before next game	
Accept other relevant answers	

(b) Define what is meant by 'tapering' and 'recovery strategies' and explain how Kate can use these in the lead up to the event to be in her ideal performance state for the race.

(6 marks)

Description	Marks
For each definition (2 x 1 mark)	
Defines the terms 'tapering' and 'recovery'	1-2
Subtotal	**2**
For each (2 x 2 marks)	
Clear explanation of how Kate could use the strategy to prepare for competition with all relevant information	2
Simple explanation of how Kate could use the strategy to prepare for competition with some information	1
Subtotal	**4**
Total	**6**

Tapering

Definition: the strategy of reducing volume and increasing or maintaining intensity in order to allow full recovery prior to competition

Explanation

- Kate should taper so she is mentally, physically, and nutritionally prepared for the race

Or

- Kate should taper so that she is able to maximise her glycogen stores before the race

Recovery

Definition: recovery strategies designed to reverse the impacts of fatigue and return athletes to performance readiness physically, mentally, and nutritionally.

Explanation

- recovery in a training program is important because it allows Kate's body time to adapt to the stress of training or replenish energy stores or repairs damaged tissues

  OR
- allows Kate to return to training sooner with better quality compared to no recovery practices implemented

  OR
- relationship between use of recovery in the prevention of overtraining

Accept other relevant answers