



PHYSICAL EDUCATION STUDIES

ATAR course examination 2021

Marking key

Marking keys are an explicit statement about what the examining panel expect of candidates when they respond to particular examination items. They help ensure a consistent interpretation of the criteria that guide the awarding of marks.

Section One: Multiple-choice

20% (20 Marks)

Question	Answer
1	d
2	b
3	c
4	a
5	a
6	a
7	b
8	a
9	c
10	c
11	b
12	a
13	d
14	c
15	d
16	b & c
17	b
18	b
19	c
20	d

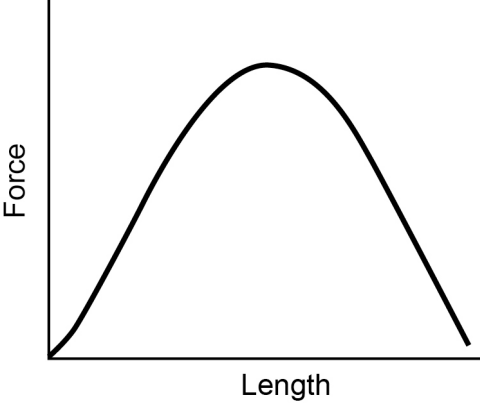
Section Two: Short answer

50% (62 Marks)

Question 21

(6 marks)

In the space provided, draw a graph of the force-length for muscle contraction and explain its application to the starting position as indicated in the above dart-throwing progression.

Description	Marks
	
Correct X and Y axis	1
Correct shape of line	1
Subtotal	2
Explanation	
Damon starts his throw with his arm bent at the elbow which allows optimal/resting/mid-range muscle length to occur in the triceps.	1
Above is due to the ability to engage/use maximum cross bridges.	1
Force is low when muscle is lengthened due to little overlap of actin and myosin.	1
Force is low when muscle is contracted (shortened) due to large overlap of actin and myosin.	1
Subtotal	4
Total	6

Question 22

(10 marks)

- (a) (i) Define 'relaxation'. (2 marks)

Description	Marks
Definition includes reference to: <ul style="list-style-type: none"> the reduction of anxiety/stress/tension/arousal levels employing a relaxation activity to achieve the physical or mental benefits, e.g. reducing heart rate. 	1–2
Total	2

- (ii) Name and outline **one** relaxation technique and how it would assist Reece to be more successful with his penalty kicks. (3 marks)

Description	Marks
Names and outlines one of the following techniques: <ul style="list-style-type: none"> breathing (1 mark) <ul style="list-style-type: none"> reference to depth and timing of breath. (1 mark) identifies physiological response, such as reducing heart or respiratory rate, or psychological response to improve confidence/concentration. (1 mark) or muscular relaxation (1 mark) <ul style="list-style-type: none"> the athlete contracts/tenses muscles and then relaxes them. (1 mark) identifies physiological response of muscle relaxation to allow better movement, such as shoulders down, shaking out their legs, or psychological response to improve confidence/concentration. (1 mark) 	1–3
Total	3
Accept other relevant answers.	

- (b) (i) Define Newton's Second Law of Motion. (2 marks)

Description	Marks
2 marks for well-defined answer such as: <ul style="list-style-type: none"> the acceleration of an object is directly proportional to the size of the applied force and inversely proportional to the mass. 	1–2
1 mark for simple answer such as: <ul style="list-style-type: none"> the statement above with reference to force or mass only or known as Law of acceleration, or Force = Mass x Acceleration (F = ma) 	
Total	2

- (ii) Outline **three** ways in which Newton's Second Law of Motion would assist Reece to kick the ball for distance. (3 marks)

Description	Marks
Outlines any three of the following: <ul style="list-style-type: none"> • increase the speed of the kicking leg • increase the run-up speed • increase contact time of the foot on the ball • increase force by using correct segmental interaction • apply a follow-through when kicking the ball to prevent deceleration. 	1–3
Total	3
Accept other relevant answers.	

Question 23**(9 marks)**

- (a) Define the term 'group cohesion'. (1 mark)

Description	Marks
Group cohesion is a term used to describe the extent to which a group cooperates together.	1
Total	1
Accept other relevant answers.	

- (b) Describe **four** strategies coaches could have used to ensure that positive group cohesion occurred within their teams during their time in the hub. (8 marks)

Description	Marks
For each of the four strategies (4 x 2 marks)	
Describes a strategy coaches use to ensure positive group cohesion	2
Makes a general statement about a strategy for group cohesion	1
Total	8
Describes any four of the following: <ul style="list-style-type: none"> • clearly communicate with players their roles and responsibilities during their time in the hub • keep them updated with communication regarding the issues surrounding why they are in the hub • have clear expectations of what is expected whilst in the hub • set challenging but realistic goals for the team as a whole and for individual players. Players are involved in this process • being fair and consistent in dealing with the players in the team • prioritise team goals over individual goals • promote high levels of motivation to keep team focused • have regular team meetings – provides an opportunity for players to voice their opinion • encouraging social interactions within the hub, e.g. a cards night, movie night, dinners together • encourage regular contact with family and friends via video call • create smaller groupings to do activities and swap them around. 	
Sample response for 2 marks Coaches are open and honest with communication (1 mark) so players are aware of their individual and collective responsibilities to decrease social loafing and thus increase team cohesion. (1 mark)	
Accept other relevant answers.	

Question 24

(10 marks)

- (a) Name the biomechanical concept a winged keel is designed around. (1 mark)

Description	Marks
Names Bernoulli's Principle/Lift	1
Total	1

- (b) Label the diagram below and explain how the principle from part (a) works to increase the velocity of the boat. (9 marks)

Description	Marks
Diagram	
<p>The diagram shows a cross-section of a winged keel. A large grey arrow points to the left, labeled "Direction of travel". An upward-pointing arrow from the top of the keel is labeled "Lift force identified (1 mark)". Text next to it says "Fast flowing water causes low pressure or High velocity and low pressure (1 mark)". Text below the keel says "Slow moving water causes high pressure or Low velocity and high pressure (1 mark)".</p>	1-3
Subtotal	3
Explanation	
<ul style="list-style-type: none"> Bernoulli's Principle states the velocity of a fluid moving over an object is inversely proportional to the pressure on the object, i.e. when the velocity of a fluid moving over an object increases, it creates a low-pressure system the shape of the wing keel/hydrofoil takes advantage of Bernoulli's Principle when the fluid moves over the keel, its velocity increases and creates a low-pressure system on top of the keel when the fluid moves under the keel, its velocity decreases and creates a high-pressure system beneath the keel high-pressure systems move to low-pressure systems, causing a lift force 	1-5
<ul style="list-style-type: none"> lift forces cause the boat to rise out of the water thus decreasing drag or lift forces cause the boat to stabilise and not tip over thus being able to move faster through the water. 	1
Subtotal	6
Total	9
Accept other relevant answers.	

Question 25

(10 marks)

- (a) (i) Define the term 'peaking'. (2 marks)

Description	Marks
2 marks for well-defined answer such as: <ul style="list-style-type: none"> Peaking is the planning of training in such a way that optimal performance is achieved at the time of competition. 	1–2
1 mark for simple answer such as: <ul style="list-style-type: none"> Peaking is when an athlete is at their optimal performance state. 	
Total	2

- (ii) Describe how Sinead could ensure 'peaking' occurs in her training. (2 marks)

Description	Marks
Describes method/s of ensuring peaking occurs in her training (2 marks)	1–2
States method/s of ensuring peaking occurs in her training (1 mark)	
Total	2
Sample answers may include: <ul style="list-style-type: none"> periodisation is the breaking up of a training program into blocks of time with specific objectives or goals that link to recovery for peaking tapering is the reduction in training volume and duration, and increase/maintain training intensity in the lead-up to her event. 	
Accept other relevant answers.	

- (b) List
- three**
- ways in which Sinead could adjust her fitness training for the two weeks before a marathon. (3 marks)

Description	Marks
Identifies any three of the following adjustments: <ul style="list-style-type: none"> reduces duration of training reduces frequency of training increases intensity of training adds extra recovery sessions, e.g. pool running includes strategies such as massage, rest days etc. 	1–3
Total	3
Accept other relevant answers.	

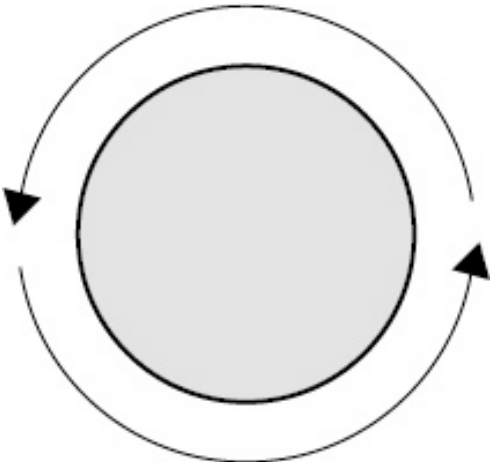
- (c) Would the golfer adjust their training program in the same way Sinead has to prepare for a marathon? Justify your response. (3 marks)

Description	Marks
No	1
Subtotal	1
Justification may include the following: <ul style="list-style-type: none"> golf is a low intensity aerobic activity tapering is most beneficial for endurance athletes 	1–2
Subtotal	2
Total	3
Accept other relevant answers.	

Question 26

(9 marks)

- (a) On the ball below, draw the direction of the spin for a right-handed curveball pitch moving away from the right-handed hitter. (1 mark)

Description	Marks
	1
Total	1

- (b) Explain the biomechanics behind how the curveball moves away from a right-handed hitter. (8 marks)

Description	Marks
<p>Explanation includes the following (1 mark per dot point):</p> <ul style="list-style-type: none"> • applies an off-centre or eccentric force to the ball • Magnus force changes the flight path of the ball due to spin while moving through the air • airflow around the spinning ball (boundary layer) going in the same direction as oncoming air creates high velocity • areas of high velocity form a low-pressure system • airflow around the spinning ball (boundary layer) going in the opposite direction as oncoming air creates low velocity • areas of low velocity form a high-pressure system • air moving from high to low-pressure causes the ball to move in the same direction • identifies that the movement of air creates a lift/Magnus force. 	1–8
Total	8

Question 27

(8 marks)

- (a) A recovery strategy Carlton employed for the team in their four-day break was having sessions of pool running, similar to the image shown above. Outline **two** ways in which this therapy would assist the player's recovery. (2 marks)

Description	Marks
Outlines any two of the following: <ul style="list-style-type: none"> • water reduces weight bearing • less impact on muscles and joints • increases blood flow through active recovery • increases waste removal from muscles. 	1–2
Total	2
Accept other relevant answers.	

- (b) (i) Name and outline **two** other recovery methods Patrick could have used as part of his recovery. (4 marks)

Description	Marks
For each recovery method (2 x 2 marks)	
Names and outlines recovery method	2
Names/outlines a recovery method	1
Total	4
Examples of recovery methods: Contrast therapy <ul style="list-style-type: none"> • alternating immersion in and out of hot and cold water Massage <ul style="list-style-type: none"> • rubbing of the muscles/roller/massage gun Cryotherapy <ul style="list-style-type: none"> • using ice packs/submerging in cold-water/use of a cryogenic chamber Compression garments <ul style="list-style-type: none"> • wearing garments that fit tightly around the skin Active recovery/stretching <ul style="list-style-type: none"> • low/moderate movement or stretching activities Hyperbaric chambers <ul style="list-style-type: none"> • time in an oxygen-rich environment. 	
Accept other relevant answers.	

Question 27 (continued)

- (ii) For each recovery method in part (b)(i), outline a benefit to Patrick of using this method. (2 marks)

Description	Marks
<p>Any the following benefits identified for part (b)(i):</p> <p>Contrast therapy</p> <ul style="list-style-type: none"> • helps increase blood flow in muscles • removes waste products from muscles or stimulation of the lymphatic system <p>Massage</p> <ul style="list-style-type: none"> • helps realign muscle fibres or reduces muscle tension • increases joint mobility and flexibility • helps increase blood flow in muscles • removes waste products from muscles or stimulation of the lymphatic system <p>Cryotherapy</p> <ul style="list-style-type: none"> • helps reduce blood flow to the muscles and reduces inflammation/swelling <p>Compression garments</p> <ul style="list-style-type: none"> • reduces the space for swelling and inflammation in muscles to occur • helps increase blood flow in muscles to remove waste products and prevent venous pooling <p>Active recovery/stretching</p> <ul style="list-style-type: none"> • helps increase blood flow in muscles to remove waste products and prevent venous pooling <p>Hyperbaric chambers</p> <ul style="list-style-type: none"> • decreases muscle inflammation • increases ability for removal of waste products 	<p>1-2</p>
Total	2
<p>Accept other relevant answers.</p>	

Section Three: Extended answer

30% (30 Marks)

Question 28

(15 marks)

Discuss **four** reasons why a coach would use each of the leadership styles listed below. For each style, outline **one** negative impact it might have on athletes or situations.

Leadership styles:

- authoritarian
- laissez-faire
- democratic.

Description	Marks
Authoritarian – any four of the following:	
<ul style="list-style-type: none"> • coaching a new team that has lacked discipline in the past • athletes may not be very experienced nor knowledgeable so require someone to provide detailed instructions and structure • dangerous activities are being conducted – activity requires guidance and strict supervision and following of rules and guidelines to avoid injuries/accidents • time is limited – decisions need to be made immediately and followed by the team • establishing authority (pre-season fitness activities) – establish authority, respect and control when starting the new year to ensure compliance to repetition and intensity, structure and organisation • in-season – coach may need to make his own decision to execute a winning tactic to advance the team/athlete. 	1–4
Negative impact of Authoritarian style – any one of the following:	
<ul style="list-style-type: none"> • lack of ownership or input by the athletes • not as much fun as the coach is too strict and the athletes may feel anxious • too many rules for athletes so they become disinterested • may not bring out the full potential of all athletes • task-oriented, not team-oriented • creates an inflexible environment • all decisions fall back on the coach, be it good or bad • not ideal for the experienced or intrinsically-motivated athlete. 	1
Subtotal	5
Laissez-faire – any four of the following:	
<ul style="list-style-type: none"> • athletes are empowered and gain independence by having to make decisions themselves which can increase their confidence and ownership within the team • when training is conducted in a relaxed atmosphere creating less pressure which may improve outcomes or progression • athletes who are intrinsically motivated and experienced who have the skills and expertise to train themselves • meets the needs of athletes who want to focus on participation, socialising and enjoyment rather than winning at all costs • coach can step back and hand control over to the athletes to identify leaders of the team during pre-season • develops athletes' problem-solving capacity by allowing them to work out strategies in mini games/drills which can be beneficial for game day • creates athletes' initiative to allow them to step up and think outside the box. 	1–4

Negative impact of Laissez-faire style – any one of the following:	
<ul style="list-style-type: none"> • limited direction and skill progression, athletes may not have the skills or expertise to develop or progress, no overall development plan • does not meet the needs of athletes who want to learn, improve performance and win as well as athletes who are extrinsically motivated • athletes can waste time and fool around and may lead to safety issues • lack of direction or forward planning limits growth of athletes/team • cause cohesion problems amongst team/ athletes. 	1
Subtotal	5
Democratic – any four of the following:	
<ul style="list-style-type: none"> • athletes are experienced and can give direct input into direction of the team • there is plenty of time to allow for decisions or planning direction of training • used during the competition season to incorporate the team in decision-making • when coaching an individual sport such as tennis • helps motivate athletes as they feel valued • females are more receptive to democratic style of coaching • when coaching junior teams who know how to play the game (not beginners). 	1–4
Negative impact of Democratic style – any one of the following:	
<ul style="list-style-type: none"> • may cause division in the team as only certain athletes are listened to • team progression may decline as there may be too many opinions on the direction the team should take so athletes argue. 	1
Subtotal	5
Total	15
Accept other relevant answers.	

Question 29

(15 marks)

- (a) Describe why Campenaerts slept in the tent. Identify and outline **four** physiological adaptations that would improve his chances of breaking the world record. (10 marks)

Description	Marks
Description may include: <ul style="list-style-type: none"> • can develop adaptations that benefit his aerobic event • sleeping in an altitude tent provides less oxygen: the body becomes more efficient in using oxygen • training can continue at sea level ('live high, train low'). 	1–2
Subtotal	2
For each physiological adaptation (4 x 1 mark) For each justification of how it helps Campenaerts (4 x 1 mark)	
Answer may include any four of the following adaptations and justifications: Increased capillarisation: <ul style="list-style-type: none"> • improves ability to supply oxygen to the muscles/gas exchange Increased haemoglobin: <ul style="list-style-type: none"> • improves oxygen carrying capacity of the blood Increased red blood cell/erythrocyte/haematocrit: <ul style="list-style-type: none"> • improves oxygen carrying capacity of the blood Increased aerobic enzymes: <ul style="list-style-type: none"> • improves the body's use of oxygen to produce ATP Increased number of mitochondria: <ul style="list-style-type: none"> • allows higher intensity aerobic respiration Increased myoglobin concentration: <ul style="list-style-type: none"> • improves the ability to store oxygen in muscles. 	1–8
Subtotal	8
Total	10
Accept other relevant answers.	

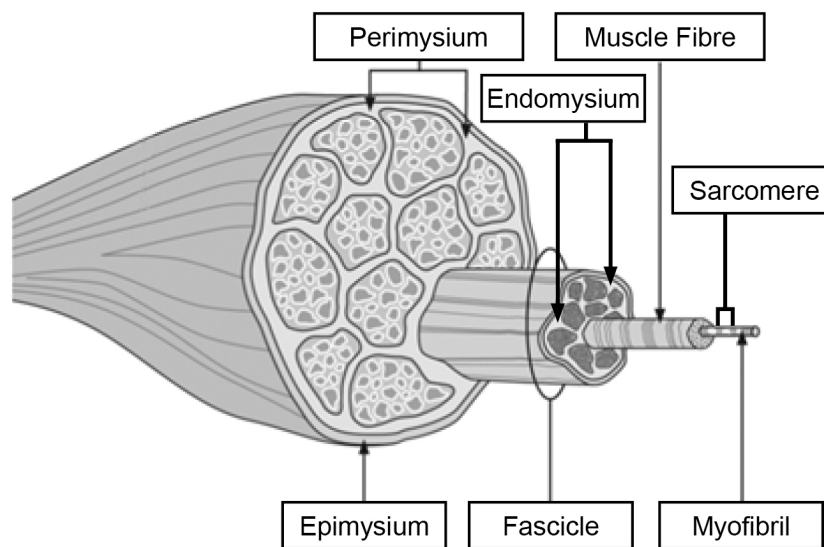
- (b) Outline the **three** cooling mechanisms Campenaerts' body used during his ride and identify **two** physiological responses that occurred to help his body dissipate (lose) heat. (5 marks)

Description	Marks
Cooling mechanisms <ul style="list-style-type: none"> • <div style="border: 1px dashed gray; padding: 5px; text-align: center; width: fit-content; margin: 5px auto;">For copyright reasons this text cannot be reproduced in the online version of this document.</div> • radiation is when the body radiates/emits heat into the environment • <div style="border: 1px dashed gray; padding: 5px; text-align: center; width: fit-content; margin: 5px auto;">For copyright reasons this text cannot be reproduced in the online version of this document.</div> 	1–3
Subtotal	3
Physiological responses <ul style="list-style-type: none"> • increased sweat production • vasodilation of the blood vessels close to the skin's surface. 	1–2
Subtotal	2
Total	5

Question 30

(15 marks)

- (a) Draw and label a diagram showing the **five** key structures of skeletal muscle and outline each structure. (10 marks)



Description	Marks
For each of responses (5 x 2 marks)	
Labels and outlines any five of the key skeletal muscle structures below	
Epimysium correctly labelled on the diagram	1
Outline of epimysium: • connective tissue surrounding the entire skeletal muscle belly or bundles of fascicles are wrapped up by the epimysium	1
Subtotal	2
Fascicle correctly labelled on the diagram	1
Outline of fascicle: • bundle of muscle fibres	1
Subtotal	2
Perimysium correctly labelled on the diagram	1
Outline of perimysium: • a layer of connective tissue that surrounds individual fascicles	1
Subtotal	2
Muscle fibre correctly labelled on the diagram	1
Outline of muscle fibre: • single muscle cell made up of myofibrils	1
Subtotal	2
Endomysium correctly labelled on the diagram	1
Outline of endomysium: • a layer of membrane that surrounds individual muscle fibre	1
Subtotal	2
Myofibril correctly labelled on the diagram	1
Outline of myofibril: • long filaments that run parallel to each other that form muscle fibres that contain the myofilaments actin and myosin	1
Subtotal	2
Sarcomere correctly labelled on the diagram	1
Outline of sarcomere: • basic contractile unit of muscle	1
Subtotal	2
Total	10

- (b) Outline **three** differences between Type IIa and Type IIb muscle fibres and identify an athletic event that best suits each type. (5 marks)

Description	Marks
1 mark for any of the following to a maximum of 3:	
<ul style="list-style-type: none"> • Type IIa more fatigue resistant than Type IIb (or vice versa) • Type IIa contracts slower than Type IIb (or vice versa) • Type IIa smaller motor neuron size than Type IIb (or vice versa) • Type IIa less force production than Type IIb (or vice versa) • Type IIa more mitochondria than Type IIb (or vice versa) • Type IIa greater capillary density than Type IIb (or vice versa) • Type IIa more myoglobin than Type IIb (or vice versa) • Type IIa combination of aerobic and anaerobic energy system Type IIb only anaerobic. 	1–3
Subtotal	3
Activity identified for Type IIa	
<ul style="list-style-type: none"> • anything lasting longer than 10 seconds, but less than 2 minutes, e.g. 400 m, 800 m. 	1
Activity identified for Type IIb	
<ul style="list-style-type: none"> • anything lasting less than 10 seconds, e.g. 100 m, high jump. 	1
Subtotal	2
Total	5
Accept other relevant answers.	

Question 31

(15 marks)

- (a) Define 'optimal projection' and explain how it would affect both the players' shots for goal. (5 marks)

Description	Marks
Definition	
<ul style="list-style-type: none"> Provides a definition for optimal projection such as the relationship between the angle, velocity and height of release to attain the goal of the athlete. 	1
Subtotal	1
For each effect (2 x 2 marks)	
Explains how optimal projection affects both players' shot	2
States how optimal projection affects both players' shot	1
Subtotal	4
Total	5
Effect for player: <ul style="list-style-type: none"> as athlete A is taller and therefore closer to the goal, athlete A will use less force than athlete B athlete B has a lower height of release; so will need a greater angle of projection than athlete A. 	
Accept other relevant answers.	

- (b) Name and outline the function of the **five** key components of the neuromuscular system that makes the movement to intercept happen. (10 marks)

Description	Marks
For each of the key components of the neuromuscular system (5 x 2 marks)	
Sensory neuron: (1 mark) <ul style="list-style-type: none"> detects ball movement from the sensory receptors and sends information to the brain. (1 mark) 	1–2
Brain: (1 mark) <ul style="list-style-type: none"> receives information from the sensory neuron: interprets the information and makes decisions based on inputs, sends response to the spinal cord/motor neuron. (1 mark) 	1–2
Spinal cord: (1 mark) <ul style="list-style-type: none"> receives information from the brain and transmits electrical signals to the motor neuron. (1 mark) 	1–2
Motor neuron: (1 mark) <ul style="list-style-type: none"> receives electrical signals from spinal cord/brain and transmits electrical signals to the muscle fibres to innervate. (1 mark) 	1–2
Motor unit: (1 mark) <ul style="list-style-type: none"> contracts muscle fibres to initiate movement to intercept ball. (1 mark) 	1–2
Total	10
Accept other relevant answers.	

ACKNOWLEDGEMENTS

Question 29(b)

Dot points 1 & 3 from: Jackson, D. (n.d.). *Temperature regulation*. Retrieved August, 2021, from <https://www.pdhpe.net/sports-medicine/what-role-do-preventative-actions-play-in-enhancing-the-wellbeing-of-the-athlete/environmental-considerations/temperature-regulation/>

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