

Victorian Certificate of Education
2021

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER Letter

PHYSICAL EDUCATION**Written examination****Monday 8 November 2021****Reading time: 11.45 am to 12.00 noon (15 minutes)****Writing time: 12.00 noon to 2.00 pm (2 hours)****QUESTION AND ANSWER BOOK****Structure of book**

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A	15	15	15
B	11	11	105
			Total 120

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or correction fluid/tape.
- No calculator is allowed in this examination.

Materials supplied

- Question and answer book of 28 pages
- Answer sheet for multiple-choice questions

Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

SECTION A – Multiple-choice questions**Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** or that **best answers** the question.

A correct answer scores 1; an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

Question 1

A skill that is the basis for the development of more sport-specific skills is a

- A. discrete motor skill.
- B. closed motor skill.
- C. continuous motor skill.
- D. fundamental movement skill.

Question 2

Which one of the following is a sociocultural factor that could influence the development of motor skills?

- A. arousal levels
- B. parenting practices
- C. geographical location
- D. the physical size and shape of an individual

Question 3

An athlete has their heart rate data collected as part of an activity analysis. Heart rate data could be used to help design a training program by first identifying

- A. the muscle groups used.
- B. appropriate fitness tests.
- C. the contribution of the energy systems.
- D. any error correction required in the athlete's movement.

Use the following information to answer Questions 4 and 5.

Following an athlete's competitive phase, they will be prescribed a training program by their fitness coaches. This training program is likely to contain less volume than the training program the athlete follows during their competitive phase but it is of similar intensity.

Question 4

Which one of the following training principles best relates to the information above?

- A. diminishing returns
- B. maintenance
- C. individuality
- D. variety

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Question 5

While completing any training program, athletes record a range of training data, such as sleep patterns, stress scores, heart rate data and teammates they have trained with.

Which one of the following is an example of sociocultural data used to monitor performance?

- A. sleep patterns
- B. stress scores
- C. heart rate data
- D. teammates the athletes have trained with

Question 6

The table below shows the effect of aerobic training on cardiovascular responses after eight weeks.

Cardiovascular response	Response 1	Response 2	Response 3	Response 4
Pre-training	120	195	23	55
Post-training	160	195	31	42

Which of the following most accurately identifies the cardiovascular responses shown in the table above?

	Response 1	Response 2	Response 3	Response 4
A.	maximal cardiac output (L/min)	resting heart rate (bpm)	maximal stroke volume (mL/beat)	maximal heart rate (bpm)
B.	maximal stroke volume (mL/beat)	maximal heart rate (bpm)	maximal cardiac output (L/min)	resting heart rate (bpm)
C.	maximal cardiac output (L/min)	maximal heart rate (bpm)	maximal stroke volume (mL/beat)	resting heart rate (bpm)
D.	maximal heart rate (bpm)	maximal stroke volume (mL/beat)	maximal cardiac output (L/min)	resting heart rate (bpm)

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Use the following information to answer Questions 7 and 8.

A junior soccer player can confidently pass the ball to a teammate during a closed training drill but has varied success when completing the same pass during a game.

Question 7

Which is the most likely stage of learning this player is at for passing a soccer ball during a game?

- A. cognitive
- B. automatic
- C. associative
- D. autonomous

Question 8

Which approach to coaching is likely to see the greatest improvement in a player's ability to pass the ball successfully to a teammate during a game?

- A. constraints-based
- B. closed drills
- C. open drills
- D. direct

Question 9

Greater strength can be generated in muscles with a

- A. greater percentage of fast-twitch muscle fibres.
- B. greater percentage of slow-twitch muscle fibres.
- C. faster speed of contraction.
- D. joint angle of 180 degrees.

Question 10

A professional basketball player took a three-point shot in a game. Knowing his shot was likely to be successful, he turned around immediately after releasing the ball and jogged towards the opposite end of the court.

What type of feedback did this basketball player use to determine that the shot was likely to be successful?

- A. intrinsic
- B. augmented
- C. knowledge of results
- D. knowledge of performance

Question 11

The image below shows a parkour movement. Parkour is an urban physical activity in which individuals run, jump, climb and vault over obstacles, often in regular community settings.



Source: Harding/Shutterstock.com

Which one of the following fitness components is the most important component in the parkour movement shown above?

- A. muscular endurance
- B. muscular strength
- C. muscular power
- D. aerobic power

Question 12

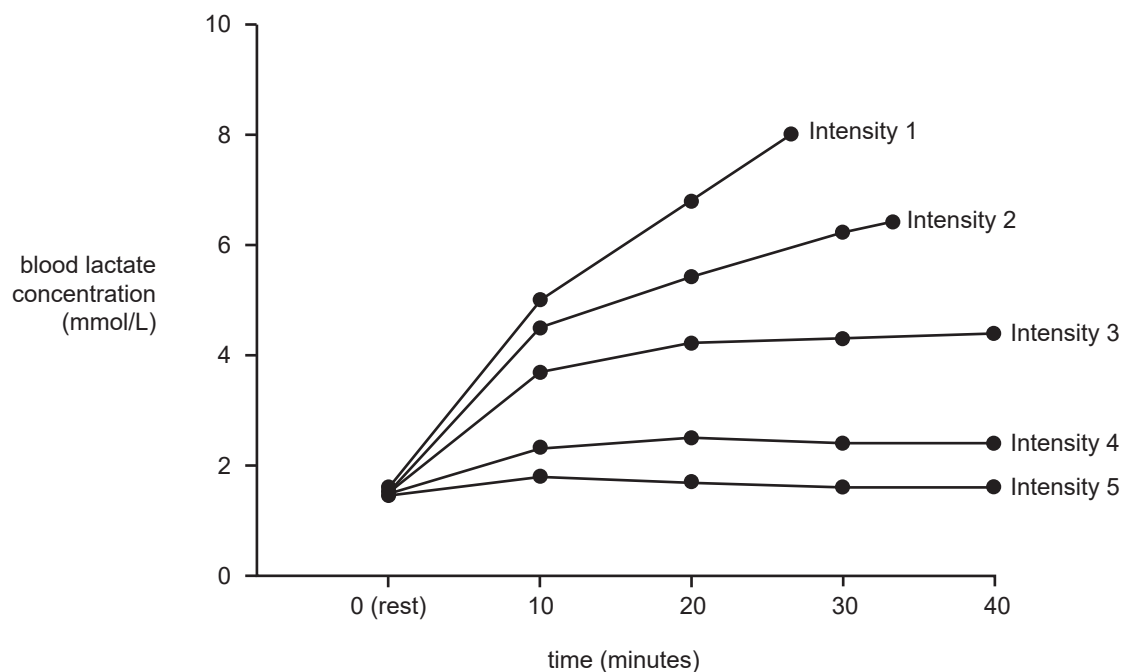
The difference between the initial position and the final position of an object is known as

- A. force.
- B. torque.
- C. momentum.
- D. displacement.

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Use the following information to answer Questions 13–15.

The graph below shows the blood lactate concentration for one individual in response to this individual exercising on five different occasions at five different intensities, labelled as Intensity 1 to Intensity 5.



Source: adapted from O Faude et al., 'Lactate threshold concepts: How valid are they?', *Sports Medicine*, vol. 39, no. 6, 2009, p. 474

Question 13

Which exercise intensity is the lowest?

- A. Intensity 1
- B. Intensity 2
- C. Intensity 3
- D. Intensity 5

Question 14

The energy system that has made the greatest contribution to Intensity 1 in the graph above is

- A. anaerobic glycolysis.
- B. lactic acid.
- C. ATP-CP.
- D. aerobic.

Question 15

At which exercise intensity or intensities has the individual exceeded their lactate inflection point (LIP)?

- A. Intensity 1 only
- B. Intensity 1 and Intensity 2
- C. Intensity 2 and Intensity 3
- D. Intensity 4 and Intensity 5

SECTION B

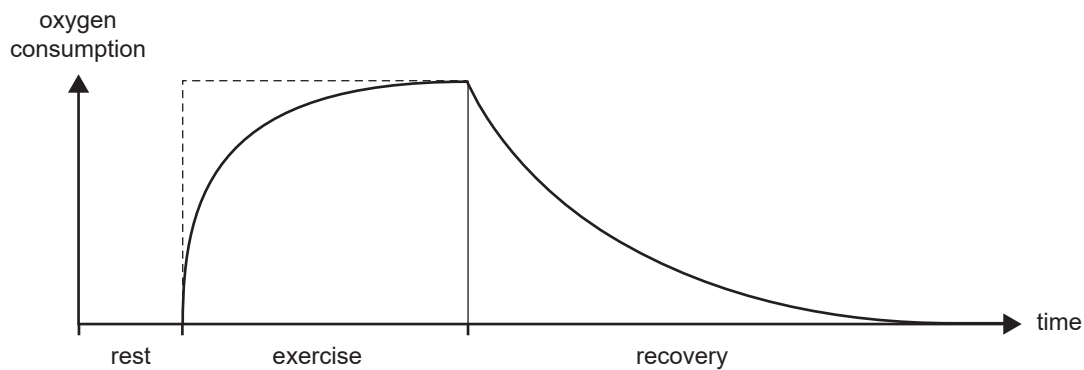
Instructions for Section B

Answer **all** questions in the spaces provided.

Question 1 (8 marks)

The graph below represents an individual's oxygen consumption during and after sub-maximal exercise.

Oxygen consumption during and after exercise



- a. On the graph above, indicate where the periods of excess post-exercise oxygen consumption (EPOC), steady state and oxygen deficit occur. 3 marks
- b. On the section of the graph that shows the period of exercise, shade the area that indicates the production of aerobic energy. 1 mark
- c. During recovery, the individual's oxygen consumption remains elevated above resting levels for a period of time. 1 mark
- Outline **one** physiological reason why heart rate remains elevated during this period of time.
- _____
- _____
- d. Indicate the changes (increase or decrease) in oxygen consumption, oxygen demand and oxygen deficit that are expected from rest to the end of the period of exercise shown in the graph above. 3 marks

Oxygen consumption _____

Oxygen demand _____

Oxygen deficit _____

Question 2 (9 marks)

Samantha is a road cyclist who competes in races that can be up to 200 km long and take five hours to complete. Samantha suffered a knee injury and was unable to train for eight weeks.

- a.** State the training principle that would explain any changes to chronic adaptations resulting from Samantha being unable to train. 1 mark

- b. i.** Name **one** change to Samantha’s cardiovascular system resulting from her being unable to train for eight weeks. 1 mark

- ii.** Explain how the change named in **part b.i.** may affect Samantha’s cycling performance. 2 marks

- c.** Using the table below, design the conditioning phase of a high-intensity interval training (HIIT) session that Samantha could use to improve her cycling performance following her injury. 5 marks

Type of training	Frequency per week	Intensity	Work period (time)	Recovery period (time)	Repetitions
<i>cycling</i>					

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Question 3 (8 marks)

A strength and conditioning coach who works with a Rugby Union team prescribes a 1 repetition maximum (RM) bench press test as part of pre-season fitness testing.

- a. Which fitness component is measured by a 1 RM bench press test? 1 mark

- b. Explain **two** processes that the strength and conditioning coach should undertake with the players before the pre-season fitness testing. 4 marks

- c. A rugby player is about to tackle an opponent who is running directly towards them.
Describe how the rugby player can adjust their line of gravity in relation to their base of support in order to improve their stability prior to contact with their opponent. 3 marks

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Question 4 (8 marks)

A young child is learning how to complete a double somersault in diving. The child uses the springboard to enter a tuck position to perform the two somersaults and then changes their body position to a layout position before entering the water.

The coach used both blocked and distributed practice within one training session to improve the child’s skill development.

The images below show a young child in the tuck position and in the layout position.



young child in tuck position



young child in layout position

Source: Elena.Degano/Shutterstock.com

Based on your understanding of the practice strategies listed above, and of the biomechanical principles of Newton’s third law of motion and conservation of angular momentum, explain how the young child performs this dive as part of their training.

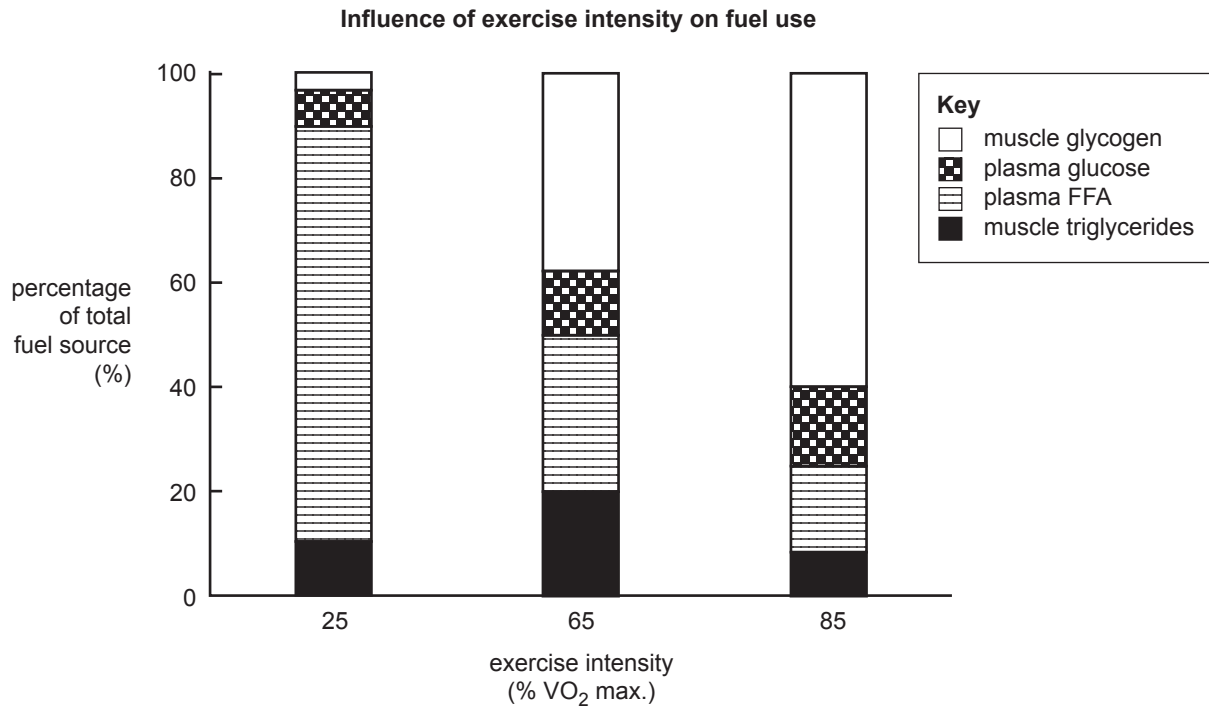
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SECTION B – continued
TURN OVER

Question 5 (5 marks)

The graph below shows the influence that exercise intensity has on the fuel sources used to produce energy.



Source: adapted from SK Powers and ET Howley,
Exercise Physiology: Theory and Application to Fitness and Performance,
 McGraw Hill Education, New York, 2018;
 licensed by CCC-Rightslink (USA) with permission from McGraw Hill Education

- a. Name the energy system that can use all fuels shown in the graph above. 1 mark

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- b. Using the graph on page 12 and your understanding of the rate of ATP production, discuss the change in fuel use as exercise intensity increases from 25% VO_2 max. to 85% VO_2 max.

4 marks

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Question 6 (17 marks)

A lacrosse stick is used to throw and catch. It is a type of lever with a net at one end.



Source: Studio77 FX vector/Shutterstock.com

- a. i.** The lacrosse stick shown in the image above is an example of which class of lever? 1 mark

- ii.** Explain the mechanical advantage of a lacrosse stick and the impact that this mechanical advantage has on velocity during a throw. 3 marks

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- b. Michelle is catching the lacrosse ball with a lacrosse stick.

Explain how Michelle can use the biomechanical principle of impulse to help prevent the ball from bouncing out of the lacrosse net.

4 marks

- c. Michelle has asked her coach how she can improve her goal-shooting technique.

Describe how the coach may use a qualitative analysis to improve Michelle's goal-shooting technique. 4 marks

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Michelle’s pre-game warm-up routine is shown in the table below.

Cardio component	walking at a moderate pace for two minutes
Stretching component	<ul style="list-style-type: none"> • three lunges • three leg swings on each leg • three torso twists in each direction • three arm swings in each direction • three neck circles in each direction • three squats
Sport-specific component	using a lacrosse stick to throw and catch from various distances with a teammate

d. Identify **one** purpose of a well-designed warm-up. 1 mark

e. Critique the effectiveness of Michelle’s warm-up routine. 4 marks

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**SECTION B – continued
TURN OVER**

Question 7 (10 marks)

Squash is a sport played on a small indoor court, in which a player hits a ball against a wall and attempts to make the ball bounce twice before their opponent can return it.

Michael played a squash match of three games with a two-minute break between games. The match lasted 45 minutes in total. During the match, he used a variety of skills during repeated, short, high-intensity rallies. These skills included short sprints, lunges, powerful drives and smash shots.

The table below shows the frequency of rally lengths during Michael's squash match. On average, there was a seven-second rest period between rallies.

Percentage of total points played per length of rally in Michael's match

Rally length (seconds)	Frequency per game (% of total points)
0–5.9 s	20.5%
6–11.9 s	19.7%
12–17.9 s	20.2%
18–23.9 s	13.4%
24–29.9 s	7.3%
≥ 30 s	18.9%

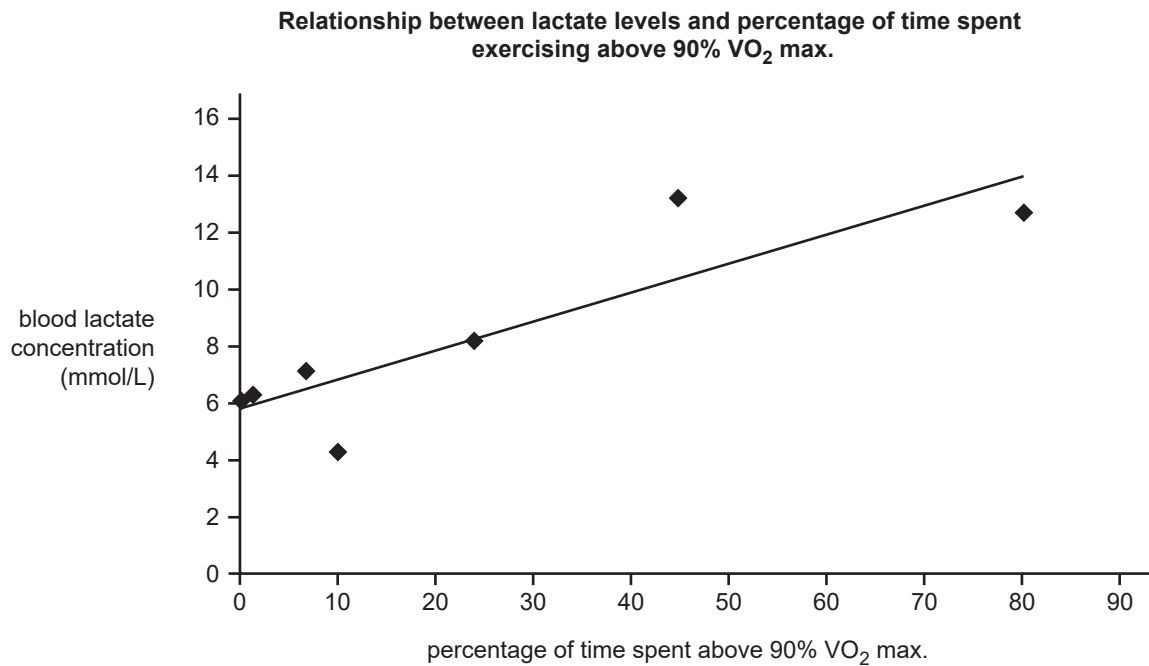
Data: adapted from O Girard et al.,
 'Game analysis and energy requirements of elite squash',
Journal of Strength and Conditioning Research, vol. 21,
 no. 3, 2007, p. 912

- a. Using specific examples from the information above, explain the interplay of energy systems that provide the energy required for Michael to complete his squash match.

6 marks

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Michael had his lactate measured during his squash match. The graph below shows the relationship between lactate levels and the percentage of time Michael spent exercising above 90% VO₂ max.



Source: adapted from O Girard et al., 'Game analysis and energy requirements of elite squash', *Journal of Strength and Conditioning Research*, vol. 21, no. 3, 2007, p. 911

- b.** Outline the relationship between blood lactate concentration and the percentage of time spent exercising above 90% VO₂ max. 1 mark

- c.** Referring to the graph above and to the fitness component of anaerobic capacity, discuss why the relationship outlined in **part b.** exists. 3 marks

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SECTION B – continued
TURN OVER

Question 8 (14 marks)

Alex is a 20-year-old athlete at state level who has been playing tennis for 10 years. Prior to the start of the new tennis season, his coach has presented him with data that was collected from Alex's last match of the previous season.

Data from Alex's last match

Measurements	Total
total number of forehands	85
total number of backhands	56
first serves in	40%
first serves won	60%
second serves in	50%
second serves won	42%
average speed of first serve	130 km/h
total metres covered in a match	1200 m
total time of match	125 minutes
total time spent above 70% HR max.	60 minutes
time spent above 85% HR max.	20 minutes
time spent above 95% HR max.	5 minutes

- a. Identify one fitness component that is important in tennis and justify your response using the data above.

3 marks

Fitness component _____

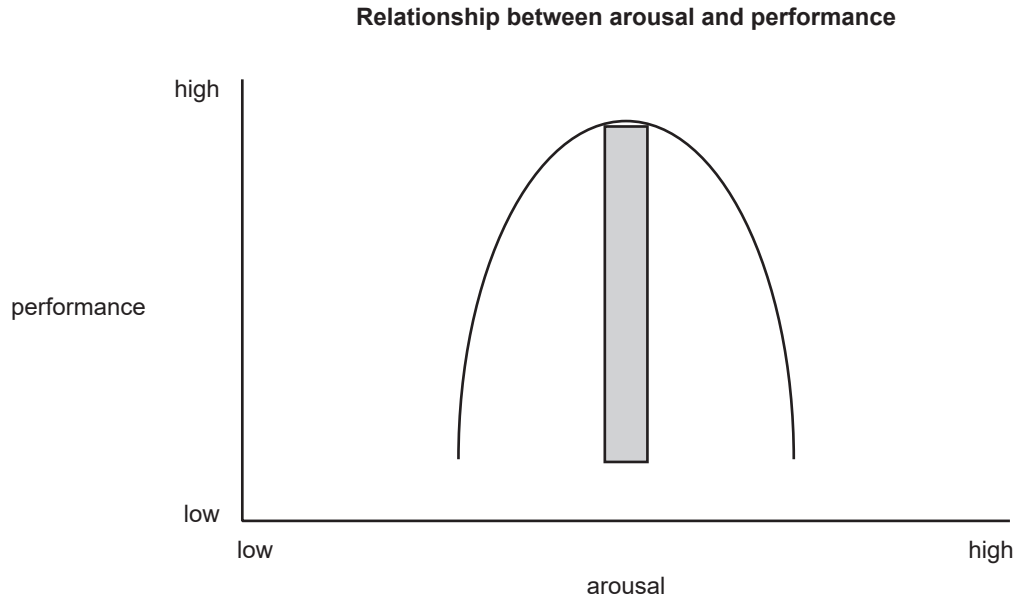
- b. i.** Name **one** standardised field-based fitness test for the fitness component identified in **part a.** 1 mark

- ii.** Describe the method of the fitness test named in **part b.i.** You may use a diagram to support your response. 2 marks

- iii.** Justify the use of the fitness test named in **part b.i.** for a state-level tennis player like Alex from a physiological, psychological and sociocultural perspective. 3 marks

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The diagram below, known as the inverted-U model, shows the relationship between arousal and performance with the zone of optimal performance shown by the shaded rectangle.



- c. As tennis players walk onto the court, they regularly listen to pump-up music in their earphones in order to regulate their arousal levels. On some days, Alex listens to pump-up music before a match, but on other days he prefers not to because it may have a negative effect on his performance.

On the diagram above:

- label with an ‘X’ when Alex may feel that he needs to use pump-up music
- label with a ‘Y’ when Alex may feel that he does not need to use pump-up music.

2 marks

- d. During matches, Alex has to return tennis serves that are as fast as 200 km/h and he must therefore be able to concentrate effectively on the ball as it leaves the opponent’s racquet.

Identify one psychological strategy that Alex may use to improve concentration and describe how this strategy could improve Alex’s ability to concentrate and return serves successfully.

3 marks

Strategy _____

Description _____

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Question 9 (5 marks)

Little Athletics Australia is a modified athletics program for children aged five to 15 years. Children aged five years learn to throw a discus using a lighter, 350 g discus and they learn to throw a javelin using a light, foam javelin.

- a. What type of constraint is being modified in the Little Athletics Australia program above? 1 mark

- b. Discuss the impact one modification from the Little Athletics Australia program could have on the motor skill development, participation and performance of children aged five years. 4 marks

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Question 10 (14 marks)

An Australian Football League Women’s (AFLW) midfielder has been provided with the following pre-season training session to improve her aerobic power for the upcoming season.

The conditioning phase of the running session lasts 20 minutes and consists of the sequence outlined in the table below, involving continuous running and bursts of higher-intensity running. For example, continuous running of 90 seconds at an intensity of 70% HR max. is immediately followed by a burst of higher-intensity running for 90 seconds at an intensity of 90% HR max. This sequence is then repeated, as indicated in the table.

Continuous running			Burst of higher-intensity running	
Number of work periods	Time (seconds)	Intensity (% HR max.)	Time (seconds)	Intensity (% HR max.)
2	90	70	90	90
4	60	70	60	90
4	30	70	30	90
4	15	70	15	90

a. What method of training is outlined above? 1 mark

b. Using the training principles of specificity, intensity and duration, evaluate the effectiveness of this training method in improving the AFLW midfielder’s aerobic power. Provide examples from the session outlined in the table to support your response. 5 marks

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- c. Provide **one** example of how the training principle of progression could be applied to this session. 1 mark

- d. Define 'cardiac output' and explain the relationship between the two cardiac factors that contribute to the measurement of cardiac output when an individual moves from rest to maximal intensity activity. 4 marks

- e. Complete the table below to outline the importance of carbohydrates, protein and water in enhancing recovery during an AFLW pre-season training program. The program involves aerobic, anaerobic and resistance training methods. 3 marks

Carbohydrates	Protein	Water

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Question 11 (7 marks)

In 2019, marathon runner Eliud Kipchoge became the first athlete to complete the 42.195 km distance in under two hours (1:59.40). His average pace was 2 minutes 50 seconds per kilometre throughout the run. A well-trained 800 m track runner attempted to hold Kipchoge’s average pace. They had to run at maximal intensity and, due to fatigue, they were unable to continue after 1 km.

- a. With reference to the lactate inflection point (LIP), explain how Kipchoge could maintain an average pace of 2 minutes 50 seconds per kilometre for 42.195 km, whereas the 800 m track runner could only run at this pace for 1 km. 4 marks

- b. i. State **one** chronic muscular adaptation that leads directly to an improvement in LIP. 1 mark

- ii. Describe the role that the chronic muscular adaptation stated in **part b.i.** plays in improving LIP. 2 marks

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