SUPERVISOR TO ATTACH
PROCESSING LABEL HERE

Write your **student number** in the boxes above. **Letter**

Physical Education

Question and Answer Book

VCE Examination – Thursday 7 November 2024

- Reading time is **15 minutes**: 3.00 pm to 3.15 pm
- Writing time is **2 hours**: 3.15 pm to 5.15 pm

Materials supplied

- Question and Answer Book of 36 pages
- Multiple-Choice Answer Sheet

Instructions

- Follow the instructions on your Multiple-Choice Answer Sheet.
- At the end of the examination, place your Multiple-Choice Answer Sheet inside the front cover of this book.

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

Contents

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

VICTORIA State Government

Section A

Instructions

- Answer **all** questions in pencil on the Multiple-Choice Answer Sheet.
- 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.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1

Which characteristic best represents a discrete motor skill?

A. The skill has a clear beginning and a clear end point.

B. The skill has no clear beginning and no clear end point.

C. The skill involves replicating exact movements in a static setting.

D. The skill includes several components that link together to form a specific sequence.

Question 2

An insufficient psychological state of alertness and anticipation is a result of

A. increased motivation.

B. increased concentration.

C. decreased arousal.

D. decreased confidence.

Question 3

During low-intensity exercise the greatest contribution of food fuel for ATP resynthesis comes from

A. fat.

B. glycogen.

C. carbohydrate.

D. phosphocreatine.

Question 4

The following table lists exercises included in a resistance training session.

Exercise	Sets	Repetitions
bench press	4	15
overhead press	4	15
pull-ups	4	15
bent-over rows	4	15
dips	4	15
bicep curls	4	15

Which fitness component is this session likely targeting?

A. muscular endurance

B. muscular strength

C. muscular power

D. speed

Question 5

Gathering heart rate data as part of an activity analysis provides which example of physiological information that can inform the design of a training program?

A. skill frequencies

B. movement patterns

C. muscle groups and actions

D. energy system contribution

Question 6

The biomechanical principle that explains that the total momentum of a system before a collision is the same as after the collision is

A. angular momentum.

B. transfer of momentum.

C. summation of momentum.

D. conservation of momentum.

Question 7

An athlete showing adaptations including increased motor unit recruitment and increased CP stores is likely to have undertaken an effective training program using which training method?

A. fartlek

B. plyometric

C. continuous

D. high-intensity interval training

Question 8

Athletes often collect different types of data to monitor their performance and recovery during training programs. Which one of the following is an example of sociological data?

A. arousal

B. heart rate

C. confidence

D. weather conditions

Question 9

How does the law of diminishing returns apply to training?

A. Athletes will improve indefinitely with constant training.

B. Changing training routines has no effect on athlete adaptations.

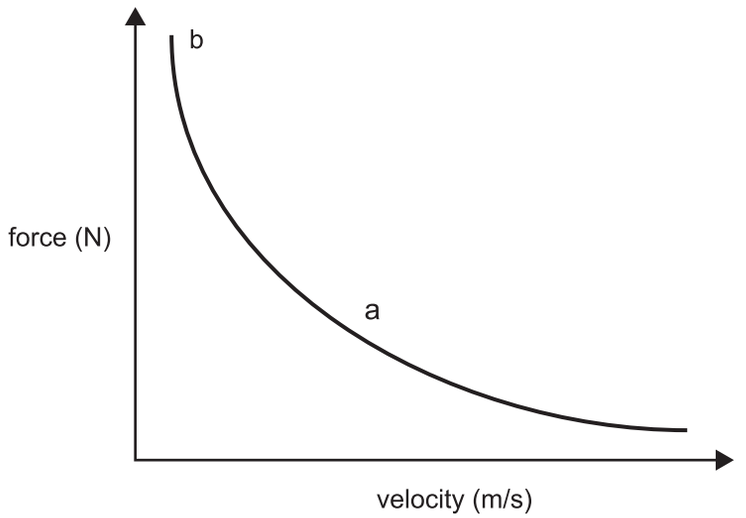
C. Larger and faster adaptations occur at higher levels of fitness with less training.

D. Initial rapid adaptations to training slow as athletes increase their level of fitness.

Use the following information to answer Questions 10 and 11.

Below is a graph showing the force–velocity curve that is used to describe the relationship between velocity of movement and amount of force generated.

Force–velocity curve



Question 10

The point marked ‘a’ on the graph best represents which fitness component?

A. speed

B. muscular power

C. muscular strength

D. muscular endurance

Question 11

When undertaking resistance training in order to develop adaptations to improve the capacity of the fitness component represented by ‘b’, an appropriate percentage of 1 RM could be

A. greater than 80%.

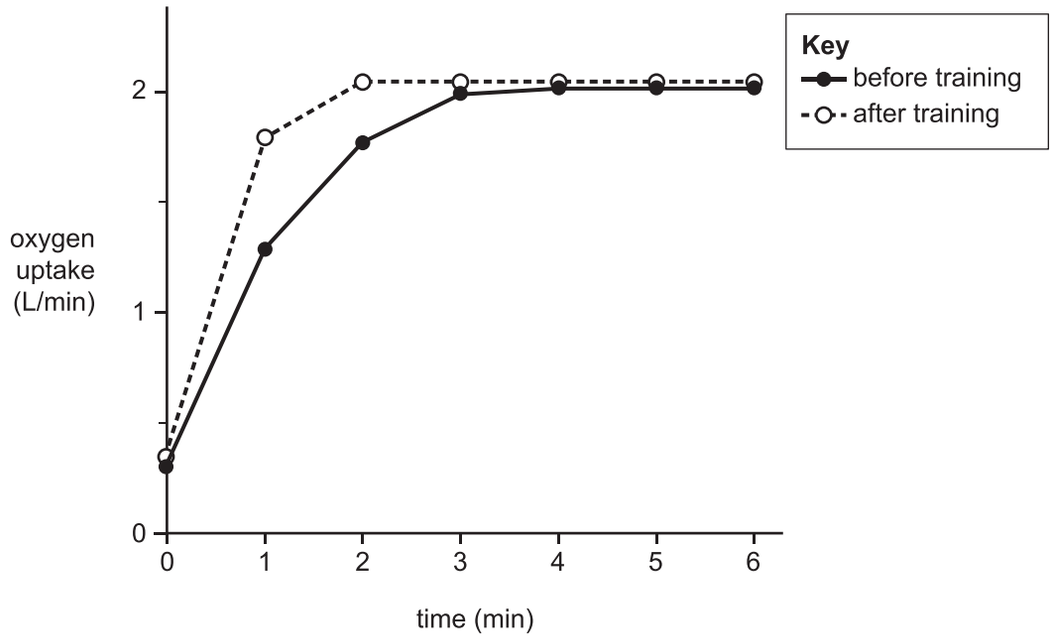
B. between 30% and 70%.

C. between 40% and 60%.

D. between 50% and 80%.

Question 12

The graph below shows the initial oxygen uptake for a submaximal activity for the same individual before and after an effective aerobic training program.



Source: Adapted from SK Powers, E Howley and J Quindry, *Exercise Physiology: Theory and Application to Fitness and Performance*, McGraw-Hill, New York, 2024

Which statement below is true for the adaptation to training shown in the graph above?

A. decreased oxygen deficit, increased anaerobic energy systems contribution

B. decreased oxygen deficit, decreased anaerobic energy systems contribution

C. increased oxygen deficit, increased anaerobic energy systems contribution

D. increased oxygen deficit, decreased anaerobic energy systems contribution

Question 13

An increase in a-vO_2 diff. would likely benefit athletes of which one of the following sports?

A. soccer (midfield position)

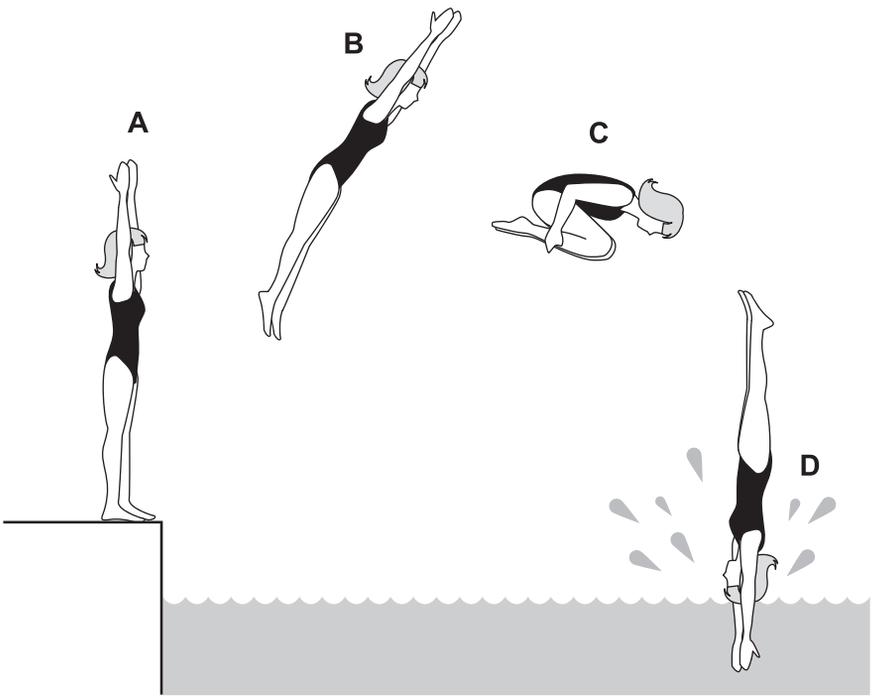
B. breakdancing

C. lawn bowls

D. table tennis

Use the following information to answer Questions 14 and 15.

The following picture shows a diver performing a forward dive in a tuck position.



Source: Adapted from <https://www.swimming.org>

Question 14

The diver is aware when the timing is correct to move her body to straight position from C to D to ensure a successful entry into the pool. This type of feedback would be considered

A. touch.

B. augmented.

C. proprioceptive.

D. knowledge of results.

Question 15

When the diver extends her arms, in position D, which one of the following statements is true?

A. She increases her angular speed.

B. She decreases her moment of inertia.

C. Her moment of inertia remains constant.

D. Her angular momentum remains constant.

End of Section A

Section B

Instructions

- Answer **all** questions in the spaces provided.
- Write your responses in English.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (7 marks)

The following table outlines a circuit training session that is undertaken by an elite netballer playing the goal keeper (GK) position. The athlete completes the circuit three times, with two minutes of rest between each station.

Station	Reps
squat jumps	10
15 m repeat sprints	5
push-ups	20
triceps dips	12
abdominal crunches	40

a. Identify the main fitness component targeted in the following stations. 2 marks

- squat jumps _____
- abdominal crunches _____

b. Outline how the inclusion of the 15 m repeat sprints in the circuit training session addresses the principle of specificity for a netball goal keeper. 2 marks

_____

_____

_____

_____

c. State two advantages of any athlete undertaking circuit training. 2 marks

Advantage 1 _____

_____

_____

Advantage 2 _____

_____

_____

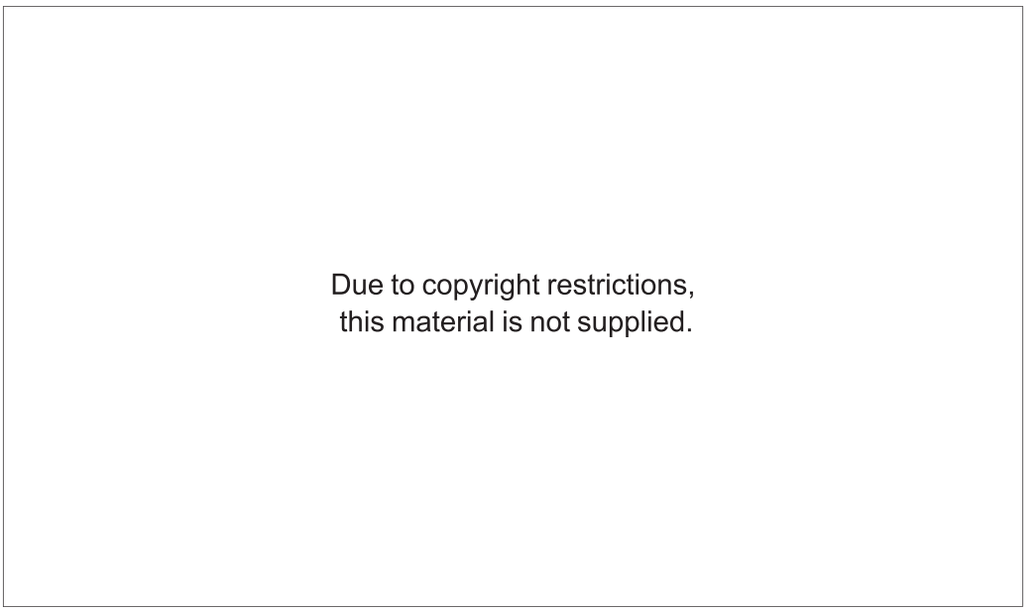
d. Other than adjusting repetitions, suggest a suitable progression to **one** of the circuit exercises performed by this player. 1 mark

_____

_____

Question 2 (15 marks)

Beach flags is a surf lifesaving sport where competitors start lying face down, head pointing away from the flags[1]. On a signal, they jump up, turn and race across soft sand to grab a flag placed 20 m away. There is one fewer flag than there are competitors, meaning that one athlete is eliminated in each round – until there is one remaining athlete who is declared the winner.



Source: https://www.beachflags.com.au

[1] **flag** – a stick or piece of rubber hose placed in the sand

The following data represents a beach flag competition of nine athletes with one eliminated after each round.

Race number	Winning sprint time (sec)	Rest time before next race (min:sec)
1	3.6	0:53
2	3.6	1:08
3	3.6	0:46
4	3.9	0:54
5	3.8	0:59
6	3.8	1:24
7	3.6	4:05
8	3.5	

Source: Data derived from Surf Lifesaving Australia video

a. Use the information provided to explain the energy system interplay in the beach flags competition. 6 marks

Question 2 continues on the next page.

b. In the table below provide a suitable example for each phase of an effective warm-up that the athletes might complete prior to the beach flag competition. 3 marks

Warm-up phases and examples
• _____ _____ • _____ _____ • _____ _____

c. Plyometrics would be a beneficial training method for a beach flags competitor, given the explosive nature of the competition.

Outline the characteristics of the muscle contraction sequence involved in a plyometric exercise. 2 marks

_____

_____

_____

d. Describe and/or draw two exercises that could be used in the conditioning phase of a plyometric training session to develop the explosive start required in beach flags. 2 marks

Conditioning phase
1.
2.

e. State a suitable **number** of repetitions you would prescribe for the plyometric exercises. 1 mark

f. At what intensity do these exercises need to be completed? 1 mark

Question 3 (10 marks)

After the success of the Australian women's soccer team, the Matildas, in the 2023 World Cup, there has been an increase in juniors participating in soccer. Many are participating in the MiniRoos Kick-Off program, an introductory program designed for children aged 4–10 years who are new to soccer. Modified games and activities aim to develop soccer skills using a smaller, lighter ball and a smaller pitch.

a. Identify the stage of learning a participant in the MiniRoos Kick-Off program is likely to be in. 1 mark

b. List one individual characteristic the learner may demonstrate at the stage identified in **part a** and outline how this may impact their learning requirements in a soccer training session. 2 marks

Characteristic

Impact on learning requirement

c. Select one of the constraints below by placing a tick (✓) in the box and explain how it can influence motor skill development. 2 marks

☐ smaller pitch

☐ smaller, lighter ball

Do not write in this area.

d. Below is a weekly schedule implemented by the coach of a junior soccer team.

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Week 1–3		120-minute training					40-minute game

After the three weeks of training, the coach noticed that the players' skill development had slowed down. As a consequence, the coach implemented the following changes for the next three weeks.

	Monday	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**	**Sunday**
Week 4–6	60-minute training		60-minute training				40-minute game

Using your understanding of practice distribution, explain why the coach noticed more improvement in skill development from Week 4 to Week 6. 3 marks

e. Explain how **one** sociocultural factor, related to the Matildas' success, influenced more children to participate in soccer. 2 marks

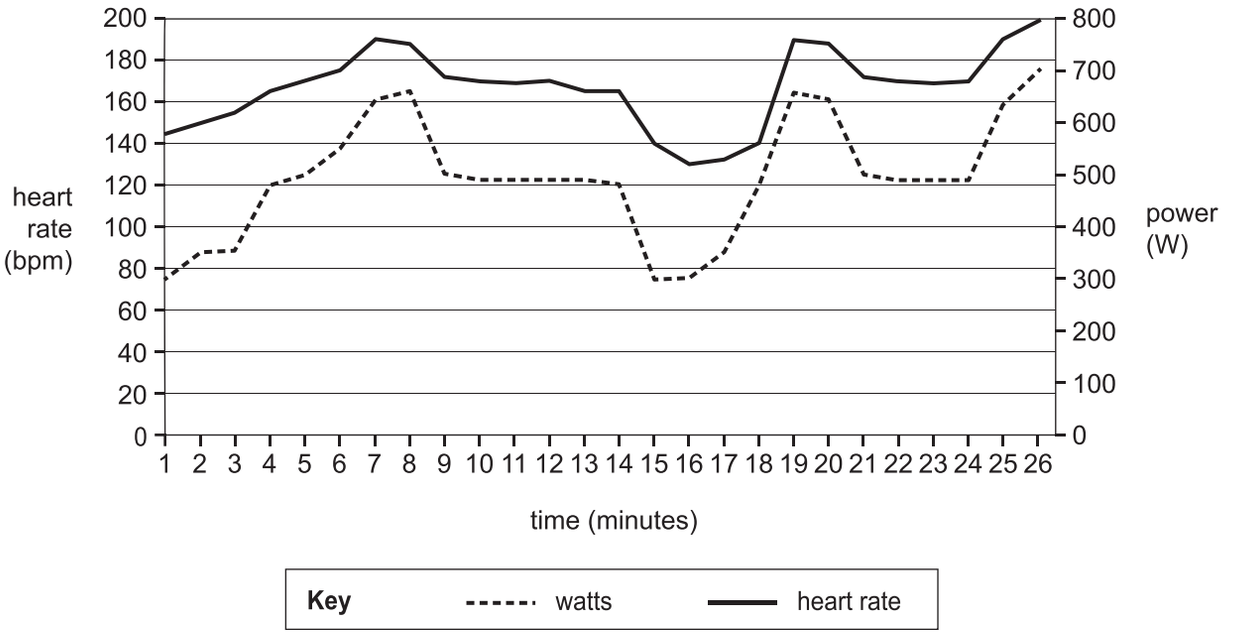
Question 4 (11 marks)

In January 2024, Australia's best cyclists competed in the Road National Championships in Ballarat. Lucas Plap placed first in the elite men's category, with a time of 4.34:26 (hr.min:sec). The athletes completed a distance of 185.6 km with steep gradients and multiple climbs. The 185.6 km distance was achieved by completing 16 laps of an 11.6 km course.

a. Discuss the likely changes in fuel contribution for energy production from the first half of the ride to the second half of the ride and how this may have impacted performance. 4 marks

b. The following data was collected for the final lap. The lap took 25:34 (min:sec) to complete.

Relationship between power output (measured as force applied through pedals) and heart rate during the final lap (time)



Making specific reference to the graph, explain the relationship between heart rate and power output throughout the lap shown in the graph and how this relationship impacts energy system requirements. 4 marks

Question 4 continues on the next page.

c. Between the 16th to 19th minutes there is a rise in heart rate and power output.

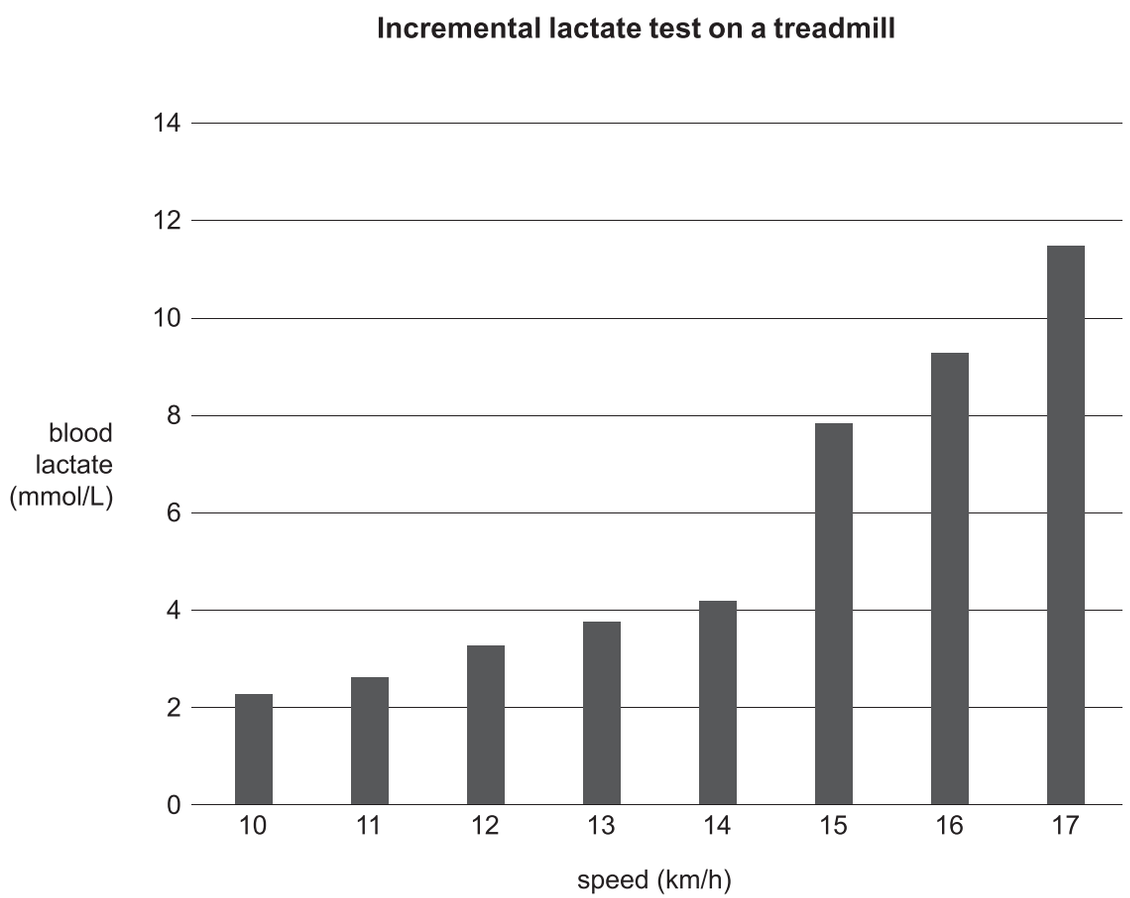
i. During this time Lucas is experiencing (circle the correct response): 1 mark

oxygen deficit steady state EPOC

ii. Identify **two** responses made by the muscular system to meet the increased power output required during this time. 2 marks

Question 5 (10 marks)

Mika has been training for a half marathon and wishes to achieve a personal best time. To understand more about his lactate inflection point (LIP) he undertakes an incremental lactate test on a treadmill. In this test, Mika runs for three minutes at each speed, before the treadmill speed is increased. At 17 km/h Mika is unable to complete the three-minute block and the test is stopped after one minute on this level. Towards the end of each three-minute block, Mika has his blood lactate measured, the results of which are displayed on the graph below.



Do not write in this area.

a. Identify the speed at which Mika was running when he reached LIP. 1 mark

b. Justify your answer to **part a** by referring to the graph. 2 marks

c. Referring to the appropriate fatigue mechanism, explain why Mika was unable to complete the final block of the lactate test. 3 marks

Question 5 continues on the next page.

d. The table below shows the first four weeks of Mika's six-week training program.

	Sunday	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
Week 1	continuous 20 min 65% max HR		HIIT 10 reps 45 sec max 45 sec active recovery	continuous 30 min 80% max HR			fartlek 30 min 60 sec 70% max HR 20 sec 85% max HR
Week 2	continuous 20 min 65% max HR		fartlek 20 min 60 sec 70% max HR 20 sec 85% max HR	continuous 30 min 80% max HR			short interval 12 reps 10 sec All out effort 60 sec rest
Week 3	continuous 20 min 65% max HR		HIIT 10 reps 45 sec max 45 sec active recovery	continuous 30 min 80% max HR			fartlek 30 min 60 sec 70% max HR 20 sec 85% max HR
Week 4	continuous 20 min 65% max HR		fartlek 20 min 60 sec 70% max HR 20 sec 85% max HR	continuous 30 min 80% max HR			intermediate interval 12 reps 30 sec 90% max HR 90 sec rest

Do not write in this area.

Giving specific examples from the table, critique the effectiveness of Mika's training program to improve his LIP. 4 marks

Question 6 (5 marks)

In a study, the VO_2 maximum, cardiac output and stroke volume of elite distance runners and university students were measured. The following data was collected:

	VO_2 max. (mL/kg/min)	**Max. cardiac output (L/min)**	**Max. stroke volume (mL/beat)**
University students	48.9	21.3	128
Elite distance runners	84.1	33.8	187

Source: B Zhou, et al., 'Stroke volume does not plateau during graded exercise in elite male distance runners', *Medicine and Science in Sports and Exercise,* vol. 33, no. 11, November 2001, pp. 1849–54

a. Other than the VO_2 max. test, identify the name of a fitness test that might be used to assess aerobic power. 1 mark

b. With reference to the data from the table above, explain why elite athletes have a higher cardiac output and how this will impact their running performance. 4 marks

Question 7 (12 marks)

Australian swimmer Kaylee McKeown finished 2023 as the world record holder in three backstroke events and is also a highly ranked 200 m individual medley swimmer. Including relays, a common swimming competition would see Kaylee race 11 times over a nine-day competition.

a. Other than mental rehearsal, recommend a psychological strategy Kaylee could use to assist with her concentration for each day's racing and outline how this would be of benefit to her. 2 marks

b. Following her 200 m backstroke semi-final world record in 2023, in which her time was 2:03.14 (min:sec), suggest the likely recovery strategy Kaylee would have completed in preparation for the final the following night. 1 mark

c. Describe the recovery strategy suggested in **part b** and justify why this type of recovery is the most suitable. 4 marks

Question 7 continues on the next page.

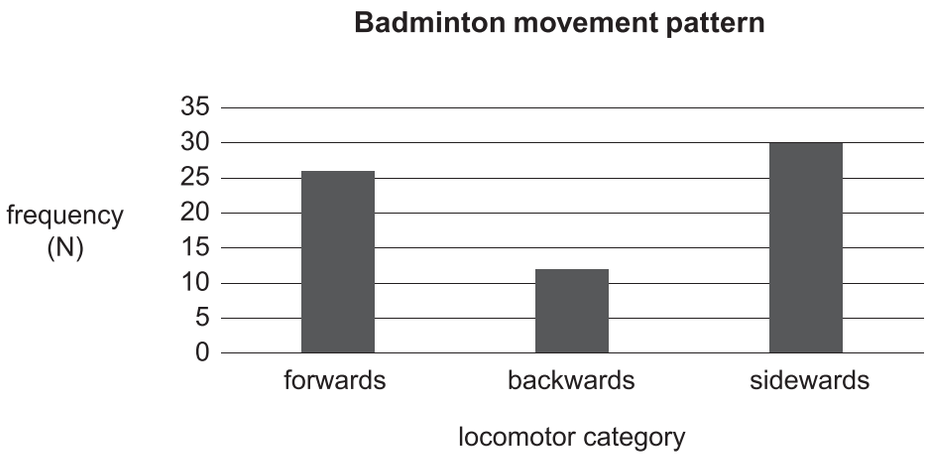
d. In preparation for a major swimming competition, Kaylee's weekly training schedule can include nine swimming sessions of 6 km each. This means that, on some days, she swims both in the morning and in the afternoon. She monitors various physiological parameters to assess her performance and recovery during training.

i. Explain how **one** type of physiological data could be used to assist with monitoring her performance and recovery during this training program. 2 marks

ii. Identify **one** chronic muscular adaptation that would occur as a result of this training program and explain how this would enhance Kaylee's performance in the 200 m backstroke event. 3 marks

Question 8 (11 marks)

Badminton is a sport that requires athletes to be very agile to cover the court. Below is a graph that shows movement patterns collected over five minutes as part of an activity analysis during a badminton match.



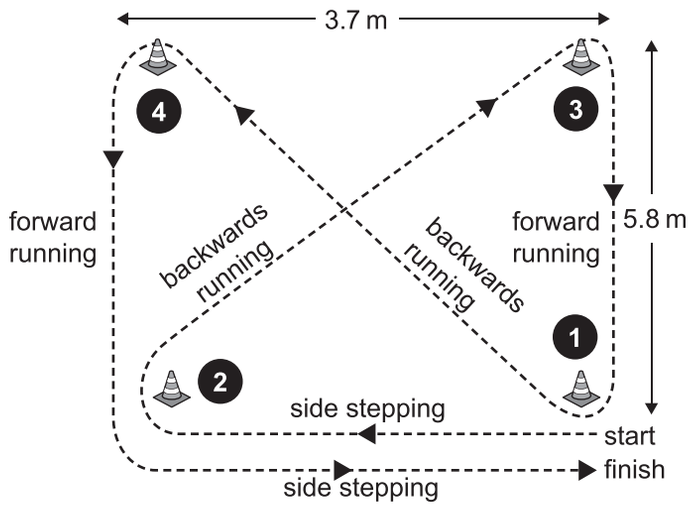
a. Define agility. 1 mark

b. Identify **one** factor that affects agility and outline how this can impact badminton performance. 2 marks

Question 8 continues on the next page.

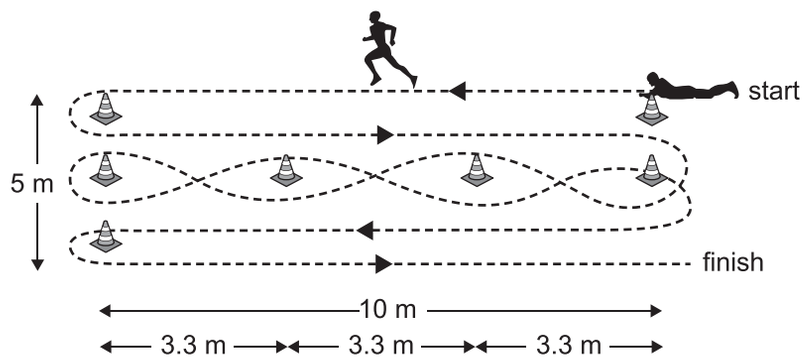
c. Below are diagrams of the Semo Agility Test and the Illinois Agility Test.

Figure A: Semo Agility Test



Source: Adapted from <www.topendsports.com>

Figure B: Illinois Agility Test



Source: Adapted from <www.topendsports.com>

Use the information above to select the most suitable test to use prior to developing a training program for badminton. Justify the selection from a physiological perspective by referring to the badminton data on page 25. 4 marks

Test _____

_____

_____

_____

_____

_____

_____

_____

Do not write in this area.

d. Outline **two** ways the test administrator could increase reliability of the test chosen in **part c**. 2 marks

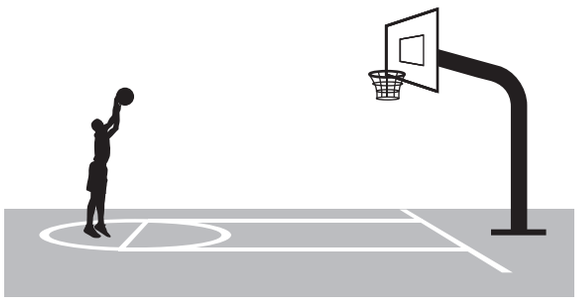
e. Identify and describe a process the test administrator should undertake before athletes attempt the agility test. 2 marks

Question 9 (9 marks)

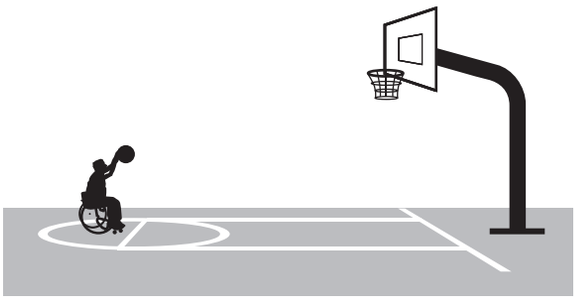
Wheelchair basketball is a Paralympic sport played indoors on a regulation basketball court. The game follows most of the rules of standard basketball but incorporates adjustments to accommodate wheelchair use.

A free throw is an opportunity given to a player to score one point, uncontested, from a position behind the free-throw line and inside the semi-circle.

The images below are of two athletes, an able-bodied athlete (Athlete A) and a wheelchair athlete (Athlete B), ready to take a free throw from the same distance away from the basket.



Athlete A



Athlete B

a. Using your understanding of projectile motion, describe **one** similarity and **one** difference in the performance of the free throws of athletes A and B by referring to the height of release and the angle of release. 3 marks

b. Explain how sitting in a wheelchair will impact **two** factors contributing to summation of momentum during the free throw. 3 marks

c. Athlete A has asked her coach how to improve her free-throw technique. The coach undertakes a qualitative movement analysis (QMA) and establishes a set of criteria for the free throw. The coach observes the shot and assesses her technique against the criteria.

Outline the final step the coach needs to take as part of a QMA and explain how this may improve Athlete A's technique. 3 marks

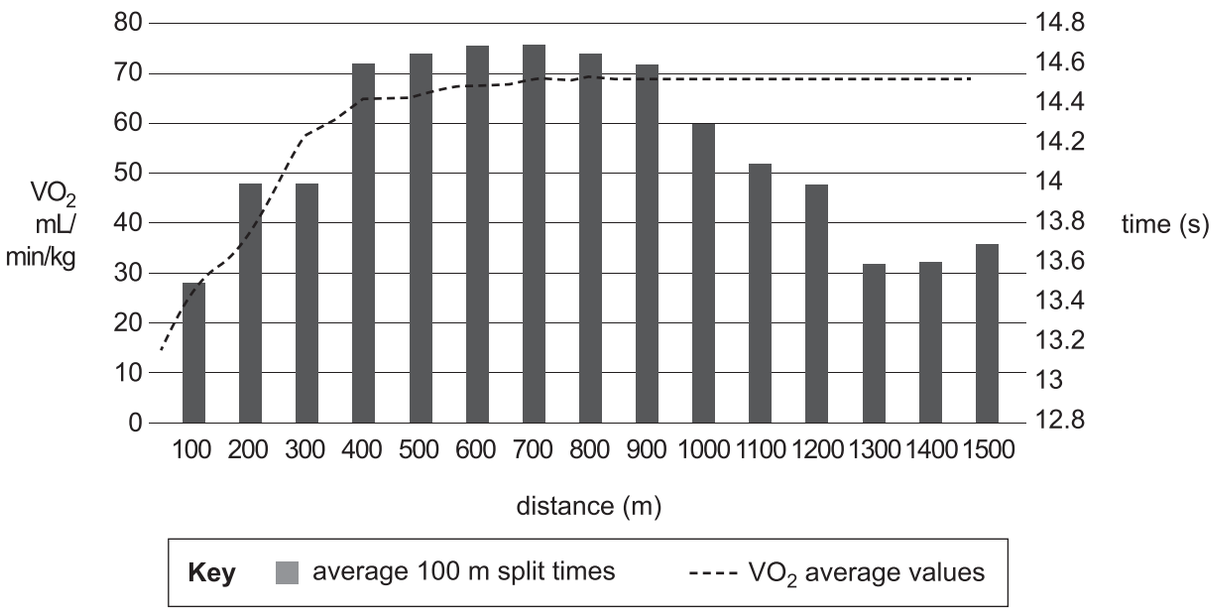
Question 10 (7 marks)

Olympian Jessica Hull is the Australian record holder in the 1500 m athletics track event with a time of 3:50.83 (min:sec).

To maximise her performance in this event, Jessica's training includes interval sessions where she completes 8–12 reps of 400 m in length with an active recovery between reps. This aims to increase her maximal speed that can be worked at aerobically, replicating the pace of her event.

The graph below displays the average VO_2 responses and 100 m split times for a group of elite 1500 m runners (such as Jessica) completing a time trial.

Average VO_2 values and 100 m split times for distance covered in 1500 m track event



Source: Adapted from Christine Hanon, et al., 'Oxygen uptake in the 1500 metres', *New Studies in Athletics*, vol. 22, no. 1, 2007, pp.15–22

a. State the likely training method described above that Jessica includes in her training program and outline one advantage of this method to improve her performance in the 1500 m event. 2 marks

Training method _____

Advantage _____

_____

Do not write in this area.

b. Identify the cause of the plateau in VO_2 reached at approximately 700 m during this event. Tick the correct box below. 1 mark

☐ VO_2 max. is reached.

☐ Steady state is reached.

c. Provide **one** reason that supports your response to **part b** by referring to the graph. 1 mark

d. Referring to the graph, discuss the relationship between intensity, VO_2 and energy system contribution between 1000 m and 1500 m. 3 marks

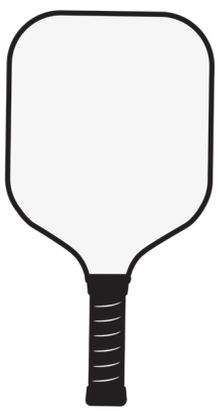
Question 11 (8 marks)

Pickleball is a net game that has gained popularity in Australia in recent years. Players hit a ball back and forth over a net in a similar manner to tennis. However, there are some differences: pickleball has a lower net, the court size is smaller and the striking implement is called a paddle, which is shorter and lighter than a tennis racquet. It is particularly popular with older Australians, with a typical player beginning at an average age of 57 years.

The tables below compare the court and striking implement dimensions between pickleball and tennis.

	Court dimensions
Pickleball	13.41 m long and 6.1 m wide
Tennis	23.77 m long and 8.23 m wide

Pickleball is played with a paddle with a length of 41 cm.



Source: Sim_Ira/Shutterstock.com

Tennis is played with a racquet with a length of 67 cm.

Source: Kashtanowww/Shutterstock.com

'I think pickleball is a great intro to tennis. But what it also is, it's a great exit for people out of tennis as well.' (Pickleball Australia Association executive officer Brendan Lee)

Using the information above, explain why pickleball has gained popularity with older Australians by applying your understanding of physiological, biomechanical and skill acquisition principles for motor skill development.

Your response should include a discussion of the interrelationship between:

- levers
- task constraints
- Newton's second law of linear motion
- fitness components.

Do not write in this area.

Question 11 continues on the next page.

End of examination questions

Extra space for responses

Clearly **number** all responses in this space.

If you use any additional Question and Answer Books to complete your responses, write your **student number** on the front cover. At the end of the examination, place the additional Question and Answer Books inside the front cover of the first Question and Answer Book.