

## 2019 PRACTICE WRITTEN EXAMINATION for VCE Units 3 & 4 PHYSICAL EDUCATION

*This Practice Exam is NOT an official VCAA paper for the Physical Education written examination. It may take slightly longer than 2hrs to complete.*

**Reading Time: 15 minutes**

**Writing Time: 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>
<b>A</b>	<b>15</b>	<b>15</b>	<b>15</b>
<b>B</b>	<b>11</b>	<b>11</b>	<b>105</b>
		<b>Total</b>	<b>120</b>

- 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 white out liquid/tape
- No calculator is allowed in this examination
- **STUDENTS ARE NOT PERMITTED TO BRING MOBILE PHONES AND/OR ANY OTHER ELECTRONIC COMMUNICATION DEVICES INTO THE EXAMINATION ROOM**

#### Instructions

- Answer all parts of all questions.
- Circle correct/most accurate multiple choice responses in this book
- Questions should be answered in the spaces provided in this book
- All written responses must be in English

## SECTION A ~ Multiple-choice questions

### Instructions

- Answer **all** questions on this exam paper or on the answer sheet provided (end of year exam).
- Tick the correct multiple choice response; in exam ~ place answer sheet inside front cover of this book.
- One mark will be awarded for a correct response & no marks deducted for an incorrect response.
- No marks awarded if more than one response is completed for any question.

### Question 1

**An acute respiratory response to performing the Semo Agility test would be:**

- A. Increased a-VO<sub>2</sub> difference
- B. Increased tidal volume
- C. Increased heart rate
- D. Decreased PC stores

### Question 2

**It is important to record what occurs during a training session in order to:**

- A. Allow a coach to see progression of training
- B. See if training goals are being met
- C. Evaluate and adjust training loads when necessary
- D. Show informed consent was obtained

### Question 3

**The most likely cause of fatigue for someone doing the 6 x 40m sprints with a W: R ratio of 1:2 would be**

- A. Dehydration
- B. H<sup>+</sup> ions being produced
- C. Glycogen depletion
- D. PC depletion

The following image shows a family taking a fun shot whilst using their trampoline and should be used to answer the next 3 questions.



**Question 4**

Which family member has the highest angular velocity?

- A. Max
- B. Brady
- C. Tim
- D. Becky

**Question 5**

In order to increase his moment of inertia, Mark should:

- A. Straighten his arms and legs
- B. Grab his knees and adopt a tuck position
- C. Bend his knees before the next bounce and push off the trampoline forcefully
- D. Increase his base of support by placing his feet further apart

**Question 6**

Steph has only just started trampolining after overcoming her fears and anxieties around injuring herself. In an effort to help her relax before each session, she should try:

- A. Progressive muscle relaxation
- B. Slow, deep breathing routines
- C. Positive self-talk
- D. All of the above

**Question 7**

Flavoured drinks containing low levels of dissolved glucose are ideal for performance recovery because they:

- A. Replace electrolytes and assist with fuel absorption over a longer period of time
- B. Assist venous return
- C. Return plasma to pre-exercise levels quickly
- D. Replace fuels and are absorbed quickly

### Question 8

**A disadvantage associated with the VO<sub>2</sub> max treadmill test is:**

- A. Accuracy is only around 90%
- B. It favours endurance runners
- C. Informed consent must be obtained
- D. A long / 24-hour recovery is required after doing the test to exhaustion, so no other testing possible

### Question 9

**Athletes are increasingly consuming carbohydrates and proteins within 30-45mins of finishing a completion or training in order to:**

- A. Restore glycogen and muscle tissue to pre-exercise levels as quickly as possible
- B. Resynthesize ATP as quickly as possible
- C. Repair muscle tissue and rebuild enzymes
- D. Refuel whilst the circulatory system is still active and capable of higher absorption rates

### Question 10

**In any Third Class lever that occurs within the human body, which of the following is TRUE?**

- A. The force is applied between the axis and the resistance
- B. The resistance occurs between the axis and the force
- C. The axis is found between the force and the resistance
- D. The force is equidistant from the resistance, being separated by the axis

### Question 11

**HIIT has been found to produce the following chronic cardiovascular adaptation:**

- A. Increased fast twitch fibres size
- B. Increased blood volumes
- C. Increased lactate tolerance
- D. Increased neural transmission speeds

### Question 12

**A junior cricketer, picks up her fathers' bat and in order to be able to use it more effectively, she holds the handle as low as possible. This makes it easier to use by:**

- A. Decreasing the moment of inertia
- B. Increasing the moment of inertia
- C. Decreasing the angular velocity
- D. Increasing the moment arm

### Question 13

**When contrasting someone at the associative stage with someone at the cognitive stage, they are more likely to:**

- A. Respond better to massed practice
- B. Detect errors they are making and start self-correcting
- C. Improve performance levels with knowledge of results
- D. Retain information/skills via blocked practice

**Question 14**

**Two students stand at the free-throw line on a basketball court – a Year 3 student and a Year 12 student. They both attempt to score by shooting the ball through the basket. The Year 3 student will need a:**

- A. Greater amount of impulse than the Y12 student to succeed
- B. Greater height of release than the Y12 student to succeed
- C. Lower height of release than the Y12 student to succeed
- D. Greater speed of release than the Y12 student to succeed

**Question 15**

**Which of the following DOES NOT occur at steady state:**

- A. The anaerobic glycolysis system is the major producer of ATP
- B. Oxygen supply is able to meet oxygen demand
- C. The arteriovenous oxygen difference remains unchanged
- D. The aerobic energy system is the major producer of ATP

**SECTION B ~ Short-answer questions**

**Question 1 (4 marks)**

The following table reveals norms for the 300-yard shuttle run for 4 different Division 1 Athletes in the USA.

<b>PERCENTILE RANKS FOR 300-YARD SHUTTLE RUN FOR NCAA DIVISION I ATHLETES (TIME IN SECONDS)</b>				
<b>Percentile Rank</b>	<b>Baseball</b>	<b>Men's Basketball</b>	<b>Women's Basketball</b>	<b>Softball</b>
90th	56.7	54.1	58.4	63.3
80th	58.9	55.1	61.8	65.1
70th	59.9	55.6	63.6	66.5
60th	61.3	56.3	64.7	67.9
50th	62.0	56.7	65.2	69.2
40th	63.2	57.2	65.9	71.3
30th	63.9	58.1	66.8	72.4
20th	65.3	58.9	68.1	74.6
10th	67.7	60.2	68.9	78.0

a. What fitness component does the 300-yard shuttle run assess? \_\_\_\_\_ **1 mark**

b. What is the most likely cause of fatigue in the 300-yard shuttle run? **1 mark**

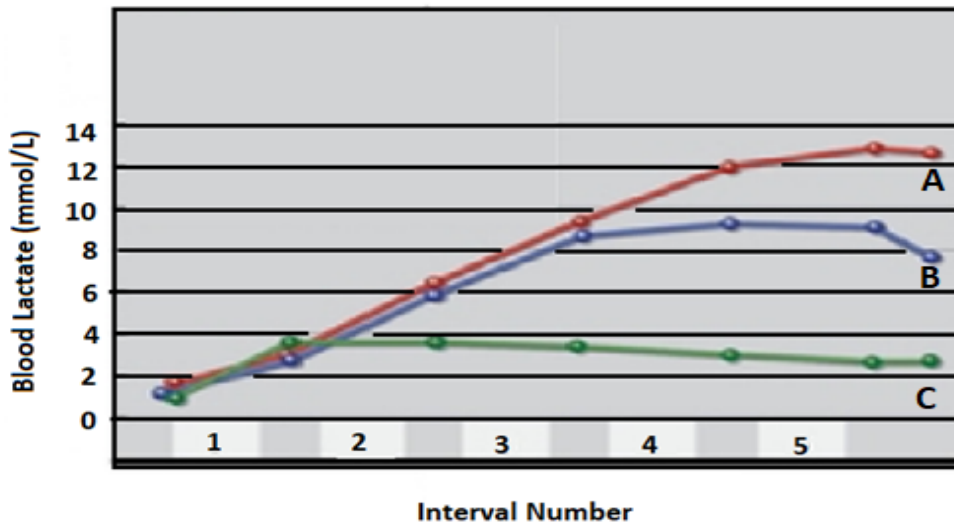
\_\_\_\_\_

c. Discuss one physiological factor that might explain why Men's basketball times are considerably faster than Women's basketball times for the 300-yard shuttle run? **2 marks**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Question 2 (9 marks)**

The following data was collected from the same runner after she had completed five repetitions of interval training on 3 different days, using 3 different intensities (A, B and C).



- a. One of the intervals required the runner to complete 5 x 800m with a 30 second rest in between each repetition. Identify which letter (A, B or C) corresponds to this type of interval training and use information from the graph to support your answer.

**3 marks**

---

---

---

- b. If the runner wanted to improve her lactate tolerance, why would she need to work above her LIP?

**2 marks**

---

---

---

- c. Her coach wants to run a series of fitness tests at the start of the next 'in-season' training. Discuss two sociocultural factors that might be considered by the coach in determining whether or not the tests are appropriate.

**4 marks**

**Factor:**

---

---

---

Factor:

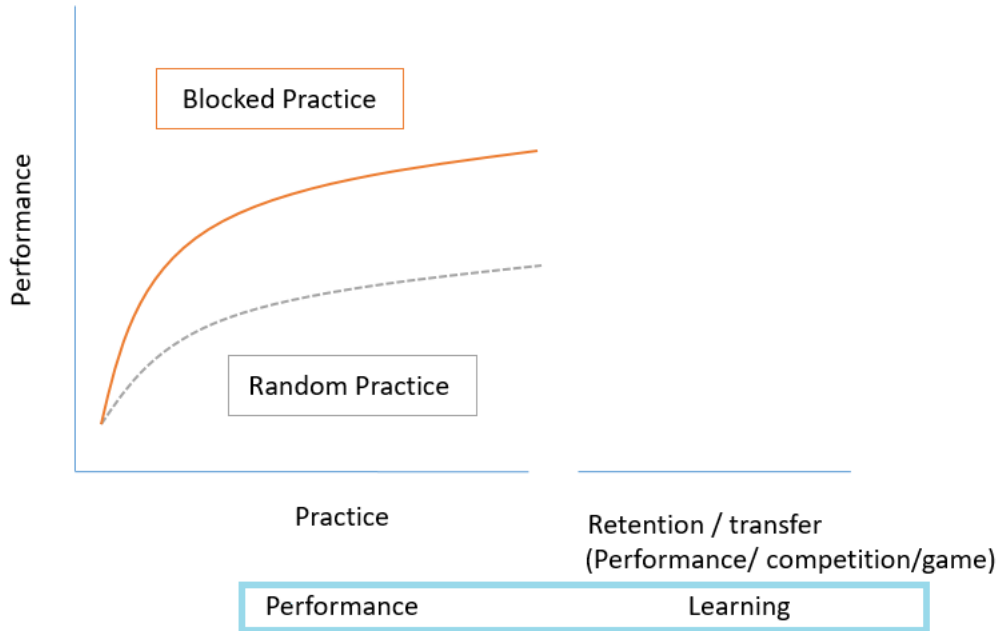
---

---

---

**Question 3 (8 marks)**

The following graph reveals many relationships associated with skill acquisition.



a. State the relationship that exists between Performance and Practice

**1 mark**

---

b. (i) By referring to the above graph, which type of practice would lead to quickest improvements in skills for someone at the cognitive stage of learning?

**1 mark**

---

(ii) Discuss why the type of practice you have chosen above leads to the quickest improvements in skills for someone at the cognitive stage of learning

**2 marks**

---

---

---



c. By drawing two lines on the above graph, clearly indicate what happens to retention/transfer of information (learning) when using blocked or random practice.

2 marks

d. Provide an example of intrinsic feedback a National level tennis player might use during a match, and discuss how this might contribute to performance improvements.

2 marks

---

---

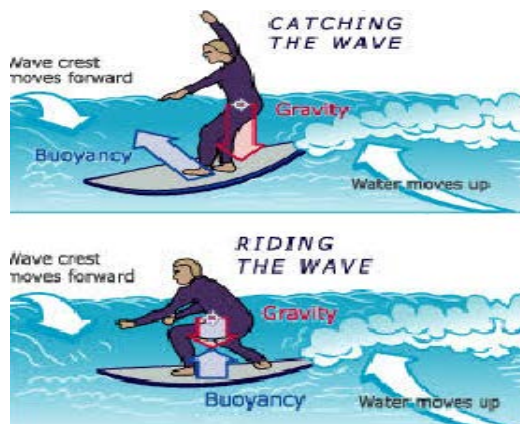
---

**Question 4 (12 marks)**

Australia's Stephanie Gilmore won her 7th world surfing title at Maui in November 2018 and the win establishes her as one of the greatest surfers of all time.



a. The following graphic shows how surfers catch a wave (start) and then ride a wave (continue surfing)



(i) List two strategies the surfer has used when riding the wave to improve balance?

2 marks

---

---

(ii) How can Newton's third law of motion be applied to this surfing scenario? Briefly discuss.

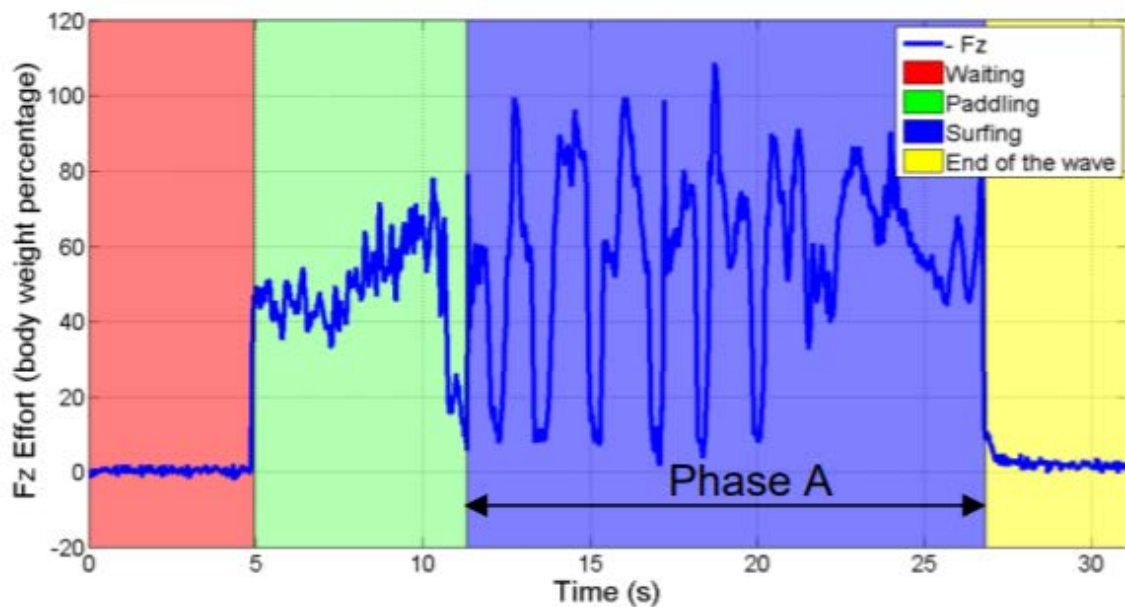
2 marks

---

---

---

b. The following graph reveals the vertical force ( $F_z$ ) exerted on the surfboard by a surfer during the different phases – waiting for a wave; paddling; surfing and end of wave:



(i) Discuss the energy system contribution during the 30 second period shown in the above graph

4 marks

---

---

---

---

---

---

---

---

---

---

---

---

---

(ii) By referring to the photo of Stephanie Gilmore, and the vertical force graph, select two fitness components that she would need to have developed to a high level in order to succeed in surfing. Clearly discuss how they contribute to successful performance. **4 marks**

**Component:** \_\_\_\_\_

**Contribution to successful surfing:**

---

---

**Component:** \_\_\_\_\_

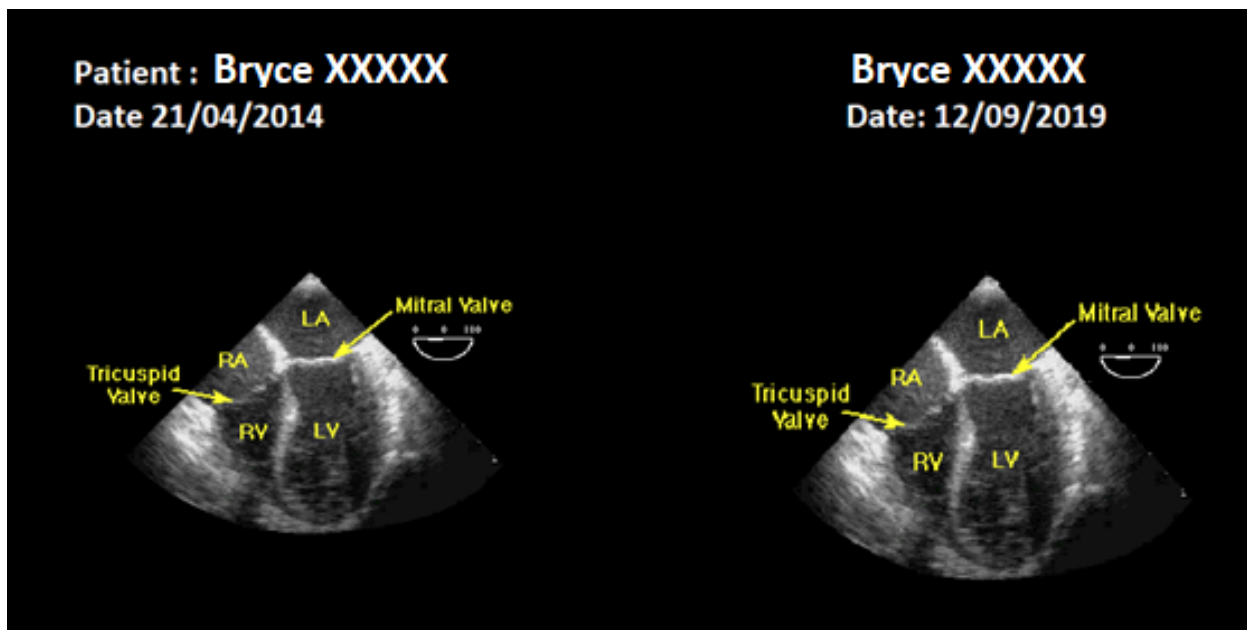
**Contribution to successful surfing:**

---

---

**Question 5 (13 marks)**

Bryce has been training and competing in Triathlons for over 10 years now. He started this as a 17-year old when he was diagnosed with asthma and his doctor recommended taking up swimming as a way of improving his condition. Bryce had further tests done 5 years ago, including an echocardiogram (ultrasound) which provided an image of his heart. He again had an echocardiogram on his heart last week.



- a. List three chronic cardiovascular adaptations Bryce would have experienced as a part of his triathlon training, and discuss how the adaptation leads to improved performances in the Triathlon. **6 marks**

Chronic Cardiovascular Adaptation	Performance Benefit
1.	
2.	
3.	

- b. The more Bryce trained for the triathlon, the harder he found it to achieve the same rate of improvement – i.e. it took longer for him to experience any gains. Identify the training principle evident in this example and in your own words discuss how it applies to all sports training. **3 marks**

**Training principle:** \_\_\_\_\_

**Application to sports:**

---



---



---

- c. The training Bryce has undertaken for the triathlon would also have resulted in chronic muscular adaptations. Apart from increased mitochondria size & number, list two other muscular adaptations he is likely to have experienced. **2 marks**

(i) \_\_\_\_\_

(ii) \_\_\_\_\_

- d. Bryce’s coach has set him a fairly high work-rate to cycle at during training sessions. This has been set at 87% maxHR and when Bryce told his PE teacher he seemed a bit puzzled and said “Mate, that’s above your LIP, are you sure you heard your coach correctly?”

Clearly discuss how it is possible for Bryce to cycle at 87% maxHR for 35 minutes. **2 marks**

---



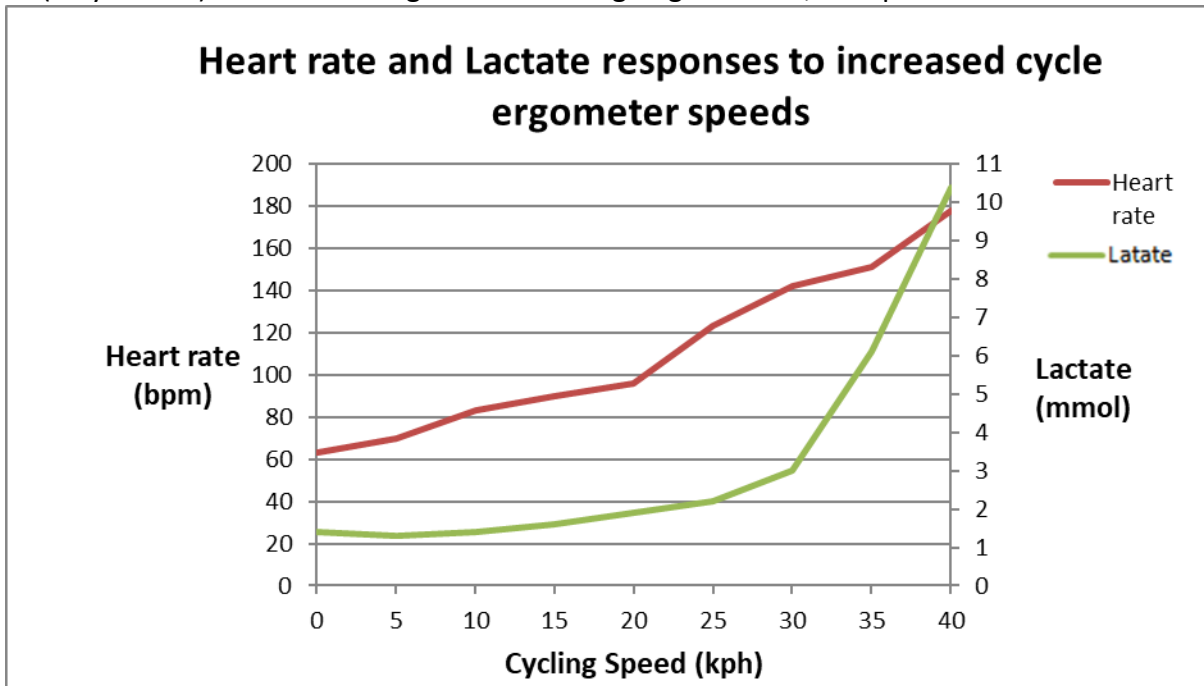
---



---

**Question 6 (4 marks)**

The following graph shows the heart rate and lactate responses to a graduated cycle ergometer test performed by a Veteran (35 year-old) Triathlete being tested before going overseas, to represent Australia.



- a. Apart from increased muscle temperature, list two acute muscular variables likely to be seen as the test progresses.

**2 marks**

- b. When the cycle speed goes above 35kph, the athlete struggles to keep going but manages to do so by using a couple of psychological strategies. List two strategies that might be used towards the end of this test to enable the athlete to keep going.

**2 marks**

**Question 7 (7 marks)**

The following is an extract from a training log belonging to a Year 12 student completing her 6-week program during Term 3 this year.

<i>Exercise number</i>	<i>Exercise</i>	<i>One min. max.</i>	<i>75% max</i>	<i>Reps Week 1</i>	<i>Reps Week 2</i>	<i>Reps Week 3</i>	<i>Reps Week 4</i>	<i>Reps Week 5</i>	<i>Reps Week 6</i>
1	Skipping	100	75	75	82	90	105	112	130
2	Sit-ups	20	15	15	17	19	25	37	49
3	Press-ups	25	19	19	21	23	27	41	53
4	Squat jumps	35	26	26	29	32	36	49	52
5	Shuttle runs (10 m)	32	24	24	26	29	34	46	59
6	Pull-ups	6	4	4	5	6	8	10	15

a. What is this type of training known as?

**1 mark**

---

b. How has overload been applied to this method?

**2 marks**

---

---

c. Has overload been applied correctly? Briefly discuss by using examples from his program.

**2 marks**

---

---

---

---

d. List two **different** ways he could have applied overload to his program, other than those evident above.

**2 marks**

---

---

**Question 8. (12 marks)**

Arizona coach Sean Miller aggressively tries to make a point to one of his players as he is subbed off after registering his 4<sup>th</sup> foul.



- a. By referring to the photo, if the player was already over-aroused due to his team falling behind with only 3 minutes of play left, what effect would the coach's actions have on the player's performance when he returns to the court? Briefly discuss. **2 marks**

---

---

---

- b. It is highly likely that the basketball player is at the autonomous stage of learning. Provide an example of an individual constraint the coach may focus on in an effort to improve the player's performances – clearly discuss how improving this factor might bring about improvements. **2 marks**

---

---

---

- c. Briefly discuss why the Semo agility test would be a better selection than the Illinois agility test to assess the agility of basketball players. **2 marks**

---

---

---

- d. The following time lapse photo shows a basketball player taking a jump shot.



- (i) Briefly discuss how force summation is used by the player to improve the force applied to the basketball at point of release. **2 marks**

---

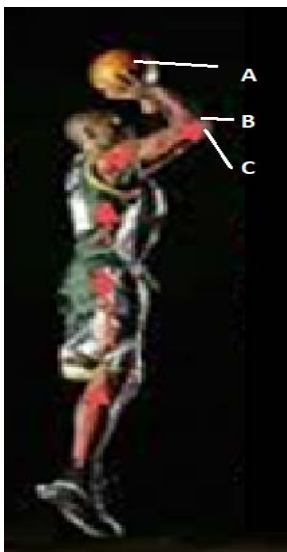


---



---

- (ii) When considering the basketballer's shooting arm, clearly identify the force, axis and resistance and place your answer in the table below, as well as identifying the class of lever shown: **4 marks**



Letter	Force or Axis or Resistance
A	
B	
C	
Class of lever	



**Question 9 (12 marks)**

Darren Clark holds the Australian record for the 400m sprint, with a time on 44.38 seconds set in 1988. Jarrod Bannister holds the Australian Javelin record with a throw of 89.02m and this was achieved in 2008.

**a.** Briefly discuss how Bannister’s recovery in between throws would be different from Darren Clark’s recovery in between the semi-final and 400m final. **2 marks**

---

---

---

**b.** Which one of the above two athletes, would most likely achieve the best “core muscle strength test”?

Clark

Bannister

**1 mark**

**c.** Clark completes 6 repetitions of a 300-metre section of an athletics track in 40 seconds, with 160 seconds recovery between repetitions.

**i.** What is the name given to this type of training?

**1 mark**

---

**ii.** What is the predominant energy system being trained whilst undertaking this training?

**1 mark**

---

**iii.** Calculate the **work: rest** ratio being applied.

**1 mark**

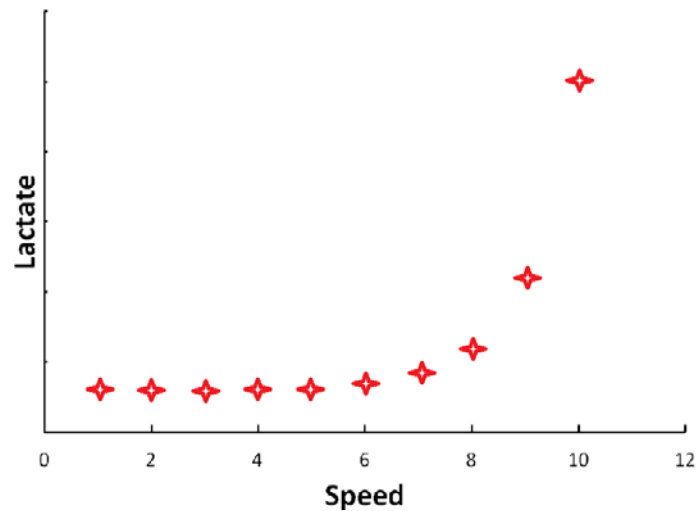
---

d. (i) As a result of their training, adaptations would have occurred to their muscles – specifically to their fast twitch fibres. Complete the following table by inserting the words ~ **increased, decreased or unchanged** to indicate the likely change following 2-3 years of training. **5 marks**

<i>Characteristic</i>	<i>Fast-twitch</i>
<i>Oxidative enzymes</i>	
<i>Glycolytic capacity</i>	
<i>Mitochondria density</i>	
<i>Capillary density</i>	
<i>Myosin ATPase</i>	

(ii) The following graph shows the lactate levels of a 400m runner at the start of the 2015 season, in response to a graduated treadmill test.

On the same graph draw a line to indicate the lactate levels following 12 months of lactate tolerance training. **1 mark**



**Question 10 (11 marks)**

Brendan is a promising young rugby player who has recently been selected to train with the Victorian team. The table below is an extract from his training diary which shows some of the activities undertaken during the physical session on Tuesdays, which is then followed by a skills session (2 hours later).

Activity	Sets & Reps
Side throws (medicine ball)	5 x 10
Zig Zag Hops	4 x 8
Overhead throws (medicine ball)	5 x 10

a. What type of training does this represent? \_\_\_\_\_ **1 mark**

b. How is the principle of 'specificity' being applied during this particular type of training? **2 marks**

---

---

---

c. Discuss two sociocultural influences that would have contributed to Brendan increasing his rate of skill development as a junior player. **4 marks**

---

---

---

---

---

d. As Brendan improves his skill development, discuss two reasons why his coach would increase the practice variability, with particular emphasis on performance improvements **4 marks**

---

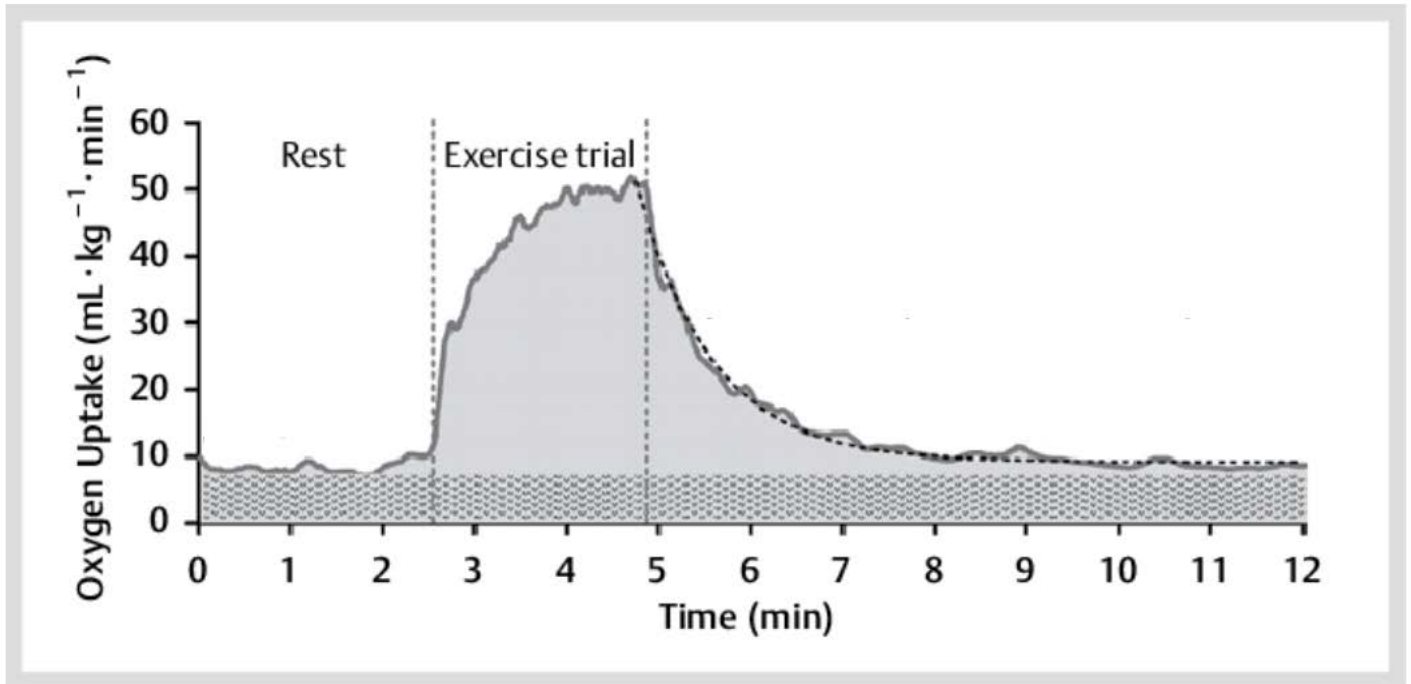
---

---

---

**Question 11 (10 marks)**

The following graph reveals the oxygen uptake during an all-out/maximal effort by a State Triathlon rep on a bicycle ergometer. The subject is able to cycle maximally for just over 2 minutes before experiencing severe localised fatigue requiring the test to be stopped.



- a. Other than increased oxygen uptake, list two other acute respiratory responses to the cycle ergometer test. **2 marks**

---

---

- b. How long does the oxygen debt last for? **1 mark**

---

- c. Assuming the subject does a passive recovery, list two key recovery mechanisms that would occur. **2 marks**

---

---

- d. On the above graph, draw the likely oxygen consumption during rest, a maximal effort on the cycle ergometer followed by a passive recovery for an Australian Representative Triathlete. **3 marks**

- e. It is likely that the higher performing Triathlete has a higher LIP. How would this be an advantage during a Triathlon? **2 marks**

---

---

---

**Question 12 (3 marks)**

Louise Burke is the Head of Sports Nutrition at the AIS and her team has found that Marathon runners who drink 'slushies' 20 minutes prior to the race starting, are better able to keep their core temperatures around 36.5–37.0 °C for longer periods of time into the race. Slushies are flavoured drinks made of ice crystals or 'frozen foam'.

Outline three ways maintaining a core temperature for longer in the marathon leads to improved performances and quicker running times. **3 marks**

---

---

---

---

**END OF EXAM**

# ANSWERS

## SECTION A ~ Multiple choice questions

QUESTION 1. **B**

QUESTION 2. **C**

QUESTION 3. **D**

QUESTION 4. **B**

QUESTION 5. **A**

QUESTION 6. **D**

QUESTION 7. **D**

QUESTION 8. **D**

QUESTION 9. **A**

QUESTION 10. **A**

QUESTION 11. **B**

QUESTION 12. **A**

QUESTION 13. **B**

QUESTION 14. **B**

QUESTION 15. **A**

## SECTION B ~ Short-answer questions

### Question 1 (4 marks)

- a. What fitness component does the 300-yard shuttle run assess? **Anaerobic Capacity** **1 mark**
- b. What is the most likely cause of fatigue in the 300-yard shuttle run? **Accumulation of H<sup>+</sup>** **1 mark**
- c. Discuss one physiological factor that might explain why Men's basketball times are considerably faster than Women's basketball times for the 300-yard shuttle run? **2 marks**
  - **Men have larger muscles than females (1 mark)**
  - **Larger muscles are able to store more PC which delays contribution from anaerobic glycolysis system and hence delays H<sup>+</sup> accumulation (1 mark)**
  - **Larger muscles are capable of producing greater contractile forces / running speeds (1 mark)**

## Question 2 (9 marks)

The following data was collected from the same runner after she had completed five repetitions of interval training on 3 different days, using 3 different intensities (A, B and C).

- a. One of the intervals required the runner to complete 5 x 800m with a 30 second rest in between each repetition. Identify which letter (A, B or C) corresponds to this type of interval training and use information from the graph to support your answer.

3 marks

- The prescription would indicate long interval training with a work greater than 1 in the 1: 1 W: R ratio. Because of this the aerobic energy system would be the major focus with very small amounts of H<sup>+</sup> accumulation during the 5 x 800m session (2 marks).
- C – this best fits the prescription (1 mark)
- Responses could state that A and B have significant increases in blood lactate and likely to be training the two anaerobic energy systems (PC and anaerobic glycolysis)

- b. If the runner wanted to improve her lactate tolerance, why would she need to work above her LIP?

2 marks

In order to improve lactate tolerance, lactate / H<sup>+</sup> needs to accumulate and the muscles need to develop increased buffering / tolerance to this. Training needs to occur above LIP in order for lactate / H<sup>+</sup> to accumulate.

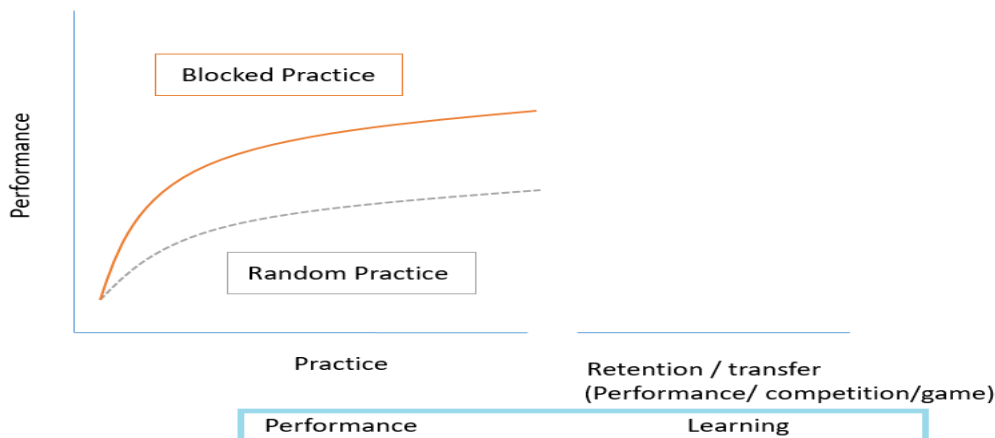
- c. Her coach wants to run a series of fitness tests at the start of the next 'in-season' training. Discuss two sociocultural factors that might be considered by the coach in determining whether or not the tests are appropriate.

4 marks

### Factors:

- Is a field test more accessible than a laboratory test (socioeconomic status / cost)?
- Is a test able to be performed with mixed gender (gender) – are there restrictions because of body image?
- Is the test run for an individual or groups of people?
- Is the test age appropriate (age) – is the test cognitively suitable?
- Are their cultural considerations (cultural) – performing in religious clothing; performing in a mixed setting?

## Question 3 (8 marks)



a. State the relationship that exists between Performance and Practice

1 mark

The longer the period of practice, the greater the performance level. (1 mark)

Or  
There is a direct relationship between practice and performance – as one increases so does the other, and conversely as one decreases so does the other. (1 mark)

b. (i) By referring to the above graph, which type of practice would lead to quickest improvements in skills for someone at the cognitive stage of learning? **1 mark**

**Blocked practice**

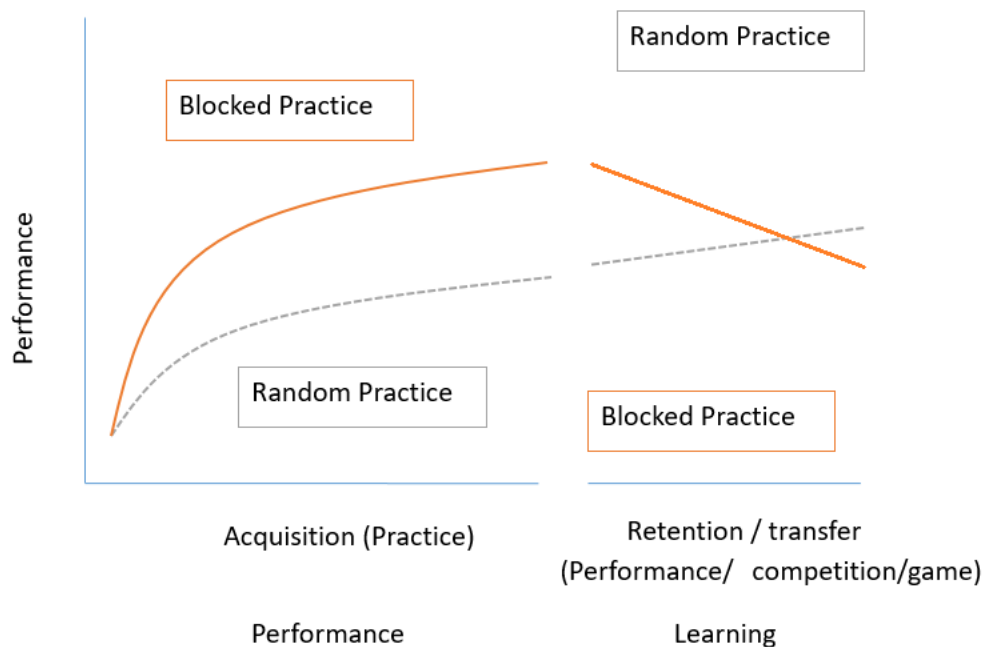
(ii) Discuss why the type of practice you have chosen above leads to the quickest improvements in skills for someone at the cognitive stage of learning **2 marks**

**Blocked practice most suitable for cognitive stage learners because it allows the:**

- Same skills to be practiced in isolation from other skills (decreasing amount of information processing, increasing levels of concentration)
- Environment to be kept constant /closed
- Skill to be replicated with high frequency and consistency

c. By drawing two lines on the above graph, clearly indicate what happens to retention/transfer of information (learning) when using blocked or random practice. **2 marks**

**1 mark for each correctly drawn line.**



d. Provide an example of intrinsic feedback a National level tennis player might use during a match, and discuss how this might contribute to performance improvements. **2 marks**



Intrinsic feedback-information received by performers as a direct result of producing a movement through the kinaesthetic senses - feelings from muscles, joints and balance. From experience, performers know what correct technique feels like. Any of the following with associated discussion about improved performance:

- Players know if they are not using correct technique and make immediate corrections so they 'feel right'
- Players can correct body position if they feel unbalanced to improve stability and hence shot performance / technique
- Players know how far their joints can move before being injured
- Players can hear the stroke being played by opponents (slice, topspin, etc..) and prepare / return accordingly
- Players process visual cues (body position, height of bounce, etc.) to make best shot selection.

#### Question 4 (12 marks)

Australia's Stephanie Gilmore won her 7th world surfing title at Maui in November 2018 and the win establishes her as one of the greatest surfers of all time.

a. The following graphic shows how surfers catch a wave (start) and then ride a wave (continue surfing)

(i) List two strategies the surfer has used when riding the wave to improve balance? **2 marks**

**Balance is improved by:**

- Lowering the centre of gravity
- Increasing the base of support by having feet wider than shoulders
- Leaning into the forward / rolling wave
- Ensuring the centre of gravity occurs over the base of support (moving hands and upper body as the lower body / board moves)

(ii) How can Newton's third law of motion be applied to this surfing scenario? Briefly discuss. **2 marks**

**For every action there is an equal and opposite reaction is shown by the surfer exerting a force downwards on the board/wave and the wave exerting an equal force in the opposite direction.**

b. The following graph reveals the vertical force ( $F_z$ ) exerted on the surfboard by a surfer during the different phases – waiting for a wave; paddling; surfing and end of wave:

(i) Discuss the energy system contribution during the 30 second period shown in the above graph

**For the duration of the surf (waiting – end of wave) all the energy systems are always contributing at varying degrees at all times to ATP production.**

**Whilst the surfer is waiting to catch a wave, they are predominantly using their aerobic system.**

**For the first 3-4 seconds when the surfer is paddling they would predominantly be using the PC system, with the anaerobic glycolysis system also contributing significantly, but the aerobic energy system only contributing a small amount to ATP production.**

**The initial efforts are high intensity / short duration and require a fast rate of energy production. When the surfer stands and then exerts high force on the board whilst surfing the PC system still produces most of the ATP, but increasingly the anaerobic glycolysis system produces ATP and the aerobic system is also increasing its contribution.**

The anaerobic glycolysis system will begin to produce most ATP half way through the surf as PC is depleted significantly. During the surf there is no time to recharge the ATP-PC system. As the surf ends and the surfer enters the water, they paddle at low intensity back out to the breakers and wait for the next wave to break which they can catch and surf back into the shoreline. While waiting the aerobic energy system is also partially recovering the intramuscular ATP and CP stores for other high intensity moves on the next wave.

**Note: The VCAA are increasingly looking at a more holistic response rather than allocating marks for separate parts of the response of energy system interplay.**

**4 marks**

- (ii) By referring to the photo of Stephanie Gilmore, and the vertical force graph, select two fitness components that she would need to have developed to a high level in order to succeed in surfing. Clearly discuss how they contribute to successful performance. **4 marks**

**1 mark awarded for correct component and 1 mark for correct link to data (diagram or graph). Cannot simply recall general knowledge of surfing.**

- **Flexibility - Evident as joints such as ankle, knee, hip are taken through full range of motion whilst riding the wave.**
- **Balance – evident by the way surfer manoeuvres her body to stay on the board as it is moving in multiple directions**
- **Agility – able to change direction of the board/body rapidly and accurately as evident by variations in force exerted on the board**
- **Co-ordination – evident in the ability to perform a sequence of movements to paddle, catch and ride the wave**
- **Anaerobic power – evident by the forceful contractions exerted on the board by the rider whilst surfing for 20 seconds at high intensity primarily calling upon the PC and anaerobic glycolysis systems.**
- **Reaction time – evident by being able to respond to the wave breaking and being able to coincide this with them being able to paddle and then stand up on the board.**

**Question 5 (13 marks)**

Bryce has been training and competing in Triathlons for over 10 years now. He started this as a 17-year old when he was diagnosed with asthma and his doctor recommended taking up swimming as a way of improving his condition. Bryce had further tests done 5 years ago, including an echocardiogram (ultrasound) which provided an image of his heart. He again had an echocardiogram on his heart last week.

- a. List three chronic cardiovascular adaptations Bryce would have experienced as a part of his triathlon training, and discuss how the adaptation leads to improved performances in the Triathlon. **6 marks**

<b>Chronic Cardiovascular Adaptation</b>	<b>Performance Benefit</b>
<p><b>1. Increased stroke volume/cardiac output</b></p> <p>If SV increases, Q must increase by default / as a matter of course.</p>	<p>More blood ejected from heart per beat which supplies greater amounts of oxygen &amp; fuels. Triathlete able to work aerobically sooner and work at higher intensities aerobically.</p> <p>Greater amounts of wastes/metabolic by-products removed delaying accumulation and contributing to faster oxidation/removal.</p>
<p><b>2. Increased blood volume</b></p>	<p>More blood = more oxygen carrying capacity and increasing amount</p>

	of aerobic ATP produced.
<b>3. Increased elasticity of arteries/blood vessels</b>	Blood vessels contribute to faster supply of oxygen, fuels BUT more importantly return from the muscles to the heart of wastes happens more efficiently/quickly. Triathlete will have delayed accumulation of wastes and hence delayed fatigue during the event.
<b>4. Increased contractility / elasticity of heart/cardiac muscle</b>	Cardiac muscle able to pump out more blood per beat – as per increased SV or Q.
<b>5. Increased capillarisation at muscle sites</b>	Muscle has greater oxygen and fuel supply and greater ability to extract oxygen (higher a-VO <sub>2</sub> diff) – as per increased blood volume.

- b. The more Bryce trained for the triathlon, the harder he found it to achieve the same rate of improvement – i.e. it took longer for him to experience any gains. Identify the training principle evident in this example and in your own words discuss how it applies to all sports training. **3 marks**

**Training principle: Law of diminishing returns**

**(1 mark)**

**Application to sports: The closer an athlete is to their genetic potential, the slower their rate of improvement will be.** **(2 marks)**

**Or..**

**The initial rate of improvement when training commences will be greater than that evident as training continues and improvements occur.**

**Or..**

**When athletes start training, the rate of improvement is rapid, but as they improve, this rate lessens as they approach their genetic limits.**

- c. The training Bryce has undertaken for the triathlon would also have resulted in chronic muscular adaptations. Apart from increased mitochondria size & number, list two other muscular adaptations he is likely to have experienced. **2 marks**

**Cannot state increased mitochondria size & number (focus on slow twitch aerobic adaptations)**

- **increased capillary supply to muscle fibres, improving gaseous exchange & movement of fuels / wastes**
- **increased myoglobin content (transports oxygen from the cell membrane to mitochondria)**
- **increased size of slow twitch fibres, allowing more glycogen to be stored**
- **increased oxidative enzymes leading to more free fatty acids being used to produce ATP (glycogen sparing)**
- **increased a-VO<sub>2</sub> difference allowing for more oxygen to be extracted from blood directed to the muscles**

- d. Bryce's coach has set him a fairly high work-rate to cycle at during training sessions. This has been set at 87% maxHR and when Bryce told his PE teacher he seemed a bit puzzled and said "Mate, that's above your LIP, are you sure you heard your coach correctly?"

Clearly discuss how it is possible for Bryce to cycle at 87% maxHR for 35 minutes.

**2 marks**

As people improve/increase their LIP, they are able to work at higher intensities whilst still working aerobically. (Highest recorded LIP – 94% maxHR) Because of this, working at 87% maxHR would not see any accumulation in H+ which would typically occur in people with lower values of LIP.

**Question 6 (4 marks)**

The following graph shows the heart rate and lactate responses to a graduated cycle ergometer test performed by a Veteran (35 year-old) Triathlete being tested before going overseas, to represent Australia.

a. Apart from increased muscle temperature, list two acute muscular variables likely to be seen as the test progresses.

**2 marks**

- Acute muscular responses include:
- Increased fibre / motor unit recruitment
- Increased lactate production
- Decreased fuels (ATP and PC @ high intensities and glycogen/triglycerides at sub-max intensities)
- Increased a-VO<sub>2</sub> diff (accepted as muscular or cardiovascular)

b. When the cycle speed goes above 35kph, the athlete struggles to keep going but manages to do so by using a couple of psychological strategies. List two strategies that might be used towards the end of this test to enable the athlete to keep going.

**2 marks**

**Psychological strategies to improve concentration and/or arousal**

- Positive self-talk
- Positive / energising imagery
- Following set-plans/goals for the ride (following a set or predetermined routine)
- Switching to a narrow internal focus

**Question 7 (7 marks)**

The following is an extract from a training log belonging to a Year 12 student completing her 6-week program during Term 3 this year.

<i>Exercise number</i>	<i>Exercise</i>	<i>One min. max.</i>	<i>75% max</i>	<i>Reps Week 1</i>	<i>Reps Week 2</i>	<i>Reps Week 3</i>	<i>Reps Week 4</i>	<i>Reps Week 5</i>	<i>Reps Week 6</i>
1	Skipping	100	75	75	82	90	105	112	130
2	Sit-ups	20	15	15	17	19	25	37	49
3	Press-ups	25	19	19	21	23	27	41	53
4	Squat jumps	35	26	26	29	32	36	49	52
5	Shuttle runs (10 m)	32	24	24	26	29	34	46	59
6	Pull-ups	6	4	4	5	6	8	10	15

a. What is this type of training known as? 1 mark

**Circuit training**

b. How has overload been applied to this method? 2 marks

**By increasing the repetitions**

c. Has overload been applied correctly? Briefly discuss by using examples from his program. 2 marks

**No, even though the overload is within the 2-10% range, it should not occur every week as it is unlikely that adaptations would occur in such a short time span, thus it is likely that overtraining would occur.**

d. List two **different** ways he could have applied overload to his program, other than those evident above.

**2 marks**

**Increase the sets; increase the number of exercises in the program; reduce the time taken to complete the program; apply weights during some exercises; reduce recovery between exercises**

### **Question 8. (12 marks)**

Arizona coach Sean Miller aggressively tries to make a point to one of his players as he is subbed off after registering his 4<sup>th</sup> foul.

- a. By referring to the photo, if the player was already over-aroused due to his team falling behind with only 3 minutes of play left, what effect would the coach's actions have on the player's performance when he returns to the court? Briefly discuss. 2 marks

**The coach's aggressive actions (pointing his finger in his face, showing discontent with facial expressions and yelling) would increase the player's arousal levels and if they are already over aroused, this would most likely lead to decreased performance levels upon returning to the court.**

- b. It is highly likely that the basketball player is at the autonomous stage of learning. Provide an example of an individual constraint the coach may focus on in an effort to improve the player's performances – clearly discuss how improving this factor might bring about improvements. 2 marks

**Individual constraints are characteristics of the individual that influence movement including: weight, body composition, fitness (speed, agility, etc), motivation, confidence, perception skills, learning styles and tactical knowledge.**

**Responses must link the individual constraint and how the coach can use it to bring about improved performances, e.g.**

- The coach may focus on improving components of fitness directly related to basketball that contribute to improved physical performance. Improved local muscular endurance will allow the player to keep performing for longer at high intensities and delay fatigue / performance drop off.**
- The coach may focus on improving decision making/tactical skills based on what opponents are doing – as soon as the player detects a set play from opposing teams he reacts to counter this, providing more effective defence.**
- The coach focusses on improving player's ability to self-monitor arousal levels and adopt strategies to keep this as close to optimal as possible throughout the game., leading to improved performance levels.**

- c. Briefly discuss why the Semo agility test would be a better selection than the Illinois agility test to assess the agility of basketball players. **2 marks**

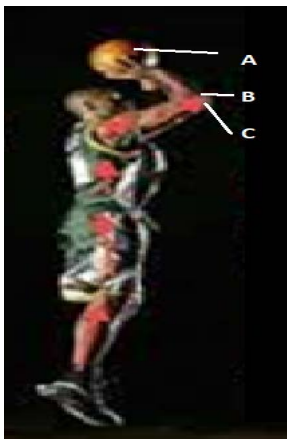
**The Semo agility test is multi-directional and better replicates the actions/movements players would make during a game than the Illinois agility test which is unidirectional.**

- d. A photo shows a basketball player taking a jump shot.

- (i) Briefly discuss how force summation is used by the player to improve the force applied to the basketball at point of release. **2 marks**

**Force summation starts in the calves, moves onto the quads, trunk/torso, biceps, triceps and into the wrist, before finally being applied to the ball via the fingers. Maximal velocity at point of release occurs as momentum is generated in a sequential manner.**

- (ii) When considering the basketballer's shooting arm, clearly identify the force, axis and resistance and place your answer in the table below, as well as identifying the class of lever shown: **4 marks**



Letter	Force or Axis or Resistance
A	Resistance
B	Force
C	Axis
Class of lever	Third - the triceps is connected to the forearm by a tendon close to the elbow joint, further emphasising this action as a third-class lever.

**Question 9 (12 marks)**

- a. Briefly discuss how Bannister's recovery in between throws would be different from Darren Clark's recovery in between the semi-final and 400m final. **2 marks**

- Bannister would use a passive recovery to replenish as much PC in between throws (major energy system = PC system)
- Clark would use an active recovery to speed up oxidation and removal of H<sup>+</sup>, followed by a passive recovery prior to the final to ensure as much PC as possible present in leg muscles. (major system = Anaerobic glycolysis system)

- b. Which one of the above two athletes, would most likely achieve the best "core muscle strength test"? **1 mark**

**Bannister – greater requirement on transferring momentum from lower to upper body than 400m runner.**

c. Clark completes 6 repetitions of a 300-metre section of an athletics track in 40 seconds, with 160 seconds recovery between repetitions.

i. What is the name given to this type of training? 1 mark

**Intermediate interval training (not just interval training)**

ii. What is the predominant energy system being trained whilst undertaking this training? 1 mark

**Anaerobic glycolysis system**

iii. Calculate the **work: rest** ratio being applied. 1 mark

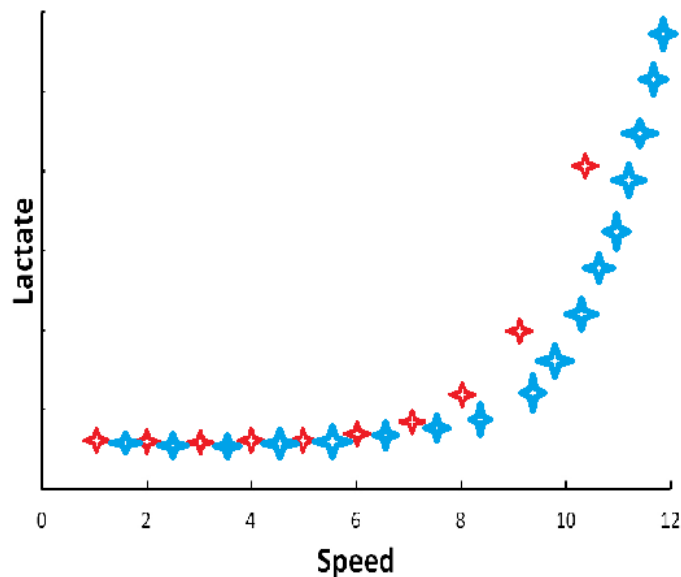
**40:160 = 1:4**

d. (i) As a result of their training, adaptations would have occurred to their muscles – specifically to their fast twitch fibres. Complete the following table by inserting the words ~ **increased, decreased or unchanged** to indicate the likely change following 2-3 years of training. 5 marks

<i>Characteristic</i>	<i>Fast-twitch</i>
<i>Oxidative enzymes</i>	<b>Unchanged</b>
<i>Glycolytic capacity</i>	<b>Increased</b>
<i>Mitochondria density</i>	<b>Unchanged</b>
<i>Capillary density</i>	<b>Slight increase</b>
<i>Myosin ATPase</i>	<b>Increase</b>

(ii) The following graph shows the lactate levels of a 400m runner at the start of the 2015 season, in response to a graduated treadmill test.

On the same graph draw a line to indicate the lactate levels following 12 months of lactate tolerance training. 1 mark



### Question 10

Brendan is a promising young rugby player who has recently been selected to train with the Victorian team. The table below is an extract from his training diary which shows some of the activities undertaken during the physical session on Tuesdays, which is then followed by a skills session (2 hours later).

Activity	Sets & Reps
Side throws (medicine ball)	5 x 10
Zig Zag Hops	4 x 8
Overhead throws (medicine ball)	6 x 10

a. What type of training does this represent?

1 mark

**Plyometrics**

b. How is the principle of 'specificity' being applied during this particular type of training?

2 marks

**The activities/actions (side throws/zig-zag hops & overhead throws) all mimic/replicate the actions used in a game of rugby.**

c. Discuss two sociocultural influences that would have contributed to Brendan increasing his rate of skill development as a junior player.

4 marks

- **SES – May have had access to higher rated coaches which would lead to quicker skill acquisition**
- **Family – support in the form of encouragement to play/practice, etc. so greater practice opportunities/motivation leading to faster improvements in skill**
- **Peers – having peers who also played/practiced rugby would contribute to greater motivation/practice and thus skill improvement**
- **Many cultures focus social activities on participation in sports, so weekends might be spent playing or watching rugby with friends or family. This would lead to improved understanding of how the game is played as well as providing more practice opportunities.**
- **Self-belief/perceived competence – With increased levels of self-belief performer more likely to practice with high frequency leading to improved skill development**



d. As Brendan improves his skill development, discuss two reasons why his coach would increase the practice variability, with particular emphasis on performance improvements

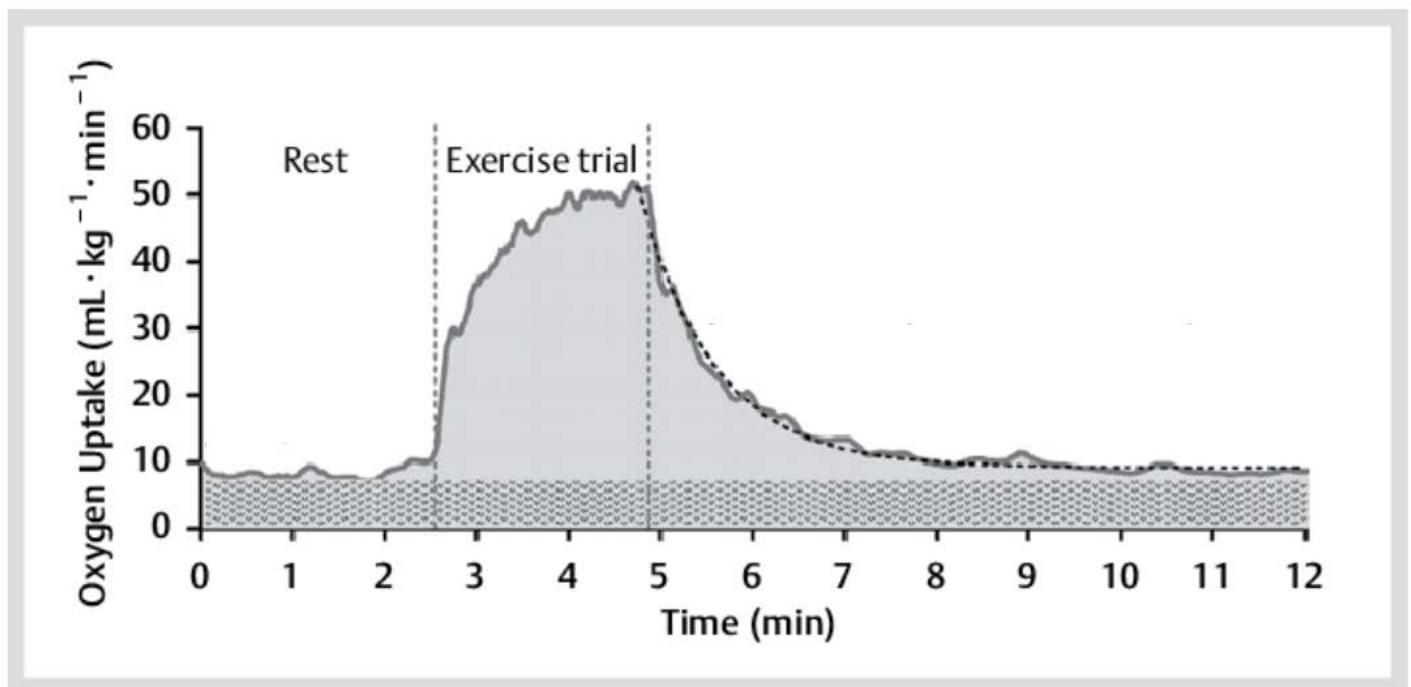
4 marks

Practice variability leads to:

- More game-like simulations
- Greater problem solving from players
- Higher retention post-training and in a game (higher levels of learning)
- More external focus of attention on intended movements

### Question 11 (10 marks)

The following graph reveals the oxygen uptake during an all-out/maximal effort by a State Triathlon rep on a bicycle ergometer. The subject is able to cycle maximally for just over 2 minutes before experiencing severe localised fatigue requiring the test to be stopped.



- a. Other than increased oxygen uptake, list two other acute respiratory responses to the cycle ergometer test. 2 marks

Any two from: Increased respiratory rate, increased tidal volume, increased gaseous exchange/diffusion, increased ventilation

- b. How long does the oxygen debt last for? 1 mark

Recovery oxygen consumption above rest = 5 – 11 – 12 minutes. ANS Approx. 6-7 minutes

- c. Assuming the subject does a passive recovery, list two key recovery mechanisms that would occur.  
Any two from:

Any two from: PC restoration / replenishment; Lactate/H<sup>+</sup> oxidation and removal; conversion/returning FFA's back to adipose stores; increased oxygenation of blood;

**2 marks**

- d. On the above graph, draw the likely oxygen consumption during rest, a maximal effort on the cycle ergometer followed by a passive recovery for an Australian Representative Triathlete. **3 marks**
- e. It is likely that the higher performing Triathlete has a higher LIP. How would this be an advantage during a Triathlon? **2 marks**

**A higher LIP allows performers to work at higher intensities whilst still working predominantly aerobically and delaying the point at which H<sup>+</sup> starts to accumulate. This means triathletes can run, cycle and swim faster without accumulating H<sup>+</sup> and contributes to quicker overall times.**

**Question 12 (3 marks)**

Outline three ways maintaining a core temperature for longer in the marathon leads to improved performances and quicker running times. **3 marks**

**Outline requires less detail than discuss when placed in the stem of a question. Responses can be in bullet point:**

- **Maintaining a core temperature delays elevated body temperature and associated dehydration (1 mark)**
- **Delaying dehydration delays increases in blood viscosity and elevated HR**
- **Delaying dehydration decreases rate of blood, oxygen and fuels being redirected to the heart (away from working muscles) (1 mark)**
- **Maintaining core reduces likelihood of oxidative and glycolytic enzymes not working efficiently and contributing to either ATP production or oxidation of by-products**
- **Maintaining core temperature delays athletes going above their LIP, and accumulating H<sup>+</sup> ions, and keeps them working aerobically at high intensities due to regular delivery of oxygen to working muscles – elevated body temp redirects oxygen away from working muscles.**

**END OF EXAM**