Discovery 2026

Australian Health, Physical Education and Sport Conference

Thursday March 5th

Session Title: VCE PE Units 3 & 4 Exam Review with links to Teaching & Learning

Presenter : Chris Clark VCAA; **Monique Sharp** Melbourne Grammar; **Rob Malpeli** Peak Phys Ed

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Section A – Multiple-choice questions

Question	Correct answer	% A	% B	% C	% D	Comments
1	D	2	0	2	**96**	
2	D	3	2	30	**65**	
3	A	**69**	8	5	17	
4	B	7	**86**	4	2	
5	C	4	0	**93**	2	
6	B	22	**62**	12	5	
7	C	36	14	**41**	9	It is an increase in size and number of mitochondria that directly leads to a delayed lactate inflection point (LIP).
8	D	2	17	3	**78**	
9	C	22	6	**58**	14	
10	C	13	22	**63**	3	
11	B	0	**96**	0	3	
12	B	1	**91**	6	2	
13	A	**75**	1	24	1	
14	B	14	**80**	2	3	
15	D	11	2	3	**83**	
16	A	**77**	3	10	11	
17	C	9	4	**84**	3	
18	B	36	**37**	11	15	It takes longer to acquire skills through random practice, but this method has a greater rate of retention.
19	C	3	16	**80**	1	
20	C	10	1	**82**	6	

Both psych skills but:

- **Stress inoculation training** focuses on teaching athletes how to cope with pressure.
- **Simulation** focuses on replicating real competition conditions so athletes can practice performing in them

Question 2

A coach who plays recorded crowd noises during practice to improve performance is implementing

A. a task constraint and simulation.
B. a task constraint and stress inoculation training.
C. an environmental constraint and stress inoculation training.
D. an environmental constraint and simulation.

Question 7

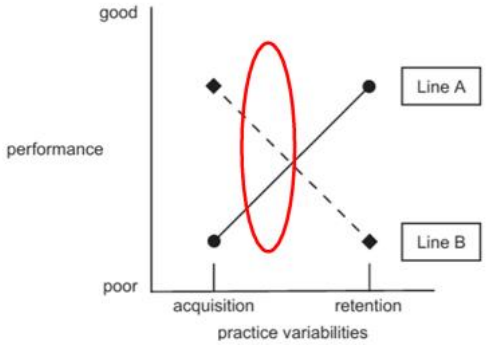
Which of the following chronic adaptations would most likely lead to a delayed LIP?

A. increased lactate tolerance
B. increased stroke volume
C. increased size and number of mitochondria
D. increased myoglobin

LIP vs. Lactate Tolerance
Still moderate confusion – more on this later!

Question 18

Likely performance outcomes associated with two different practice variabilities



Which practice variability is associated with performance outcomes best represented by line A?

A. blocked
B. random
C. massed

Rate of acquisition slower for random but retention = higher. Acquisition stage performance given as a FINAL – they could be equal BUT retention = what happens next.

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At the end of the event, Curtis's heart rate and oxygen consumption would have remained elevated as part of the process of returning the body to pre-exercise level.

1a. Name the term used to describe this process.

Question 1a.

Monique

Mark	0	1	Average
%	18	82	0.8

Nice entry level question.

The correct answer was 'excess post-exercise oxygen consumption (EPOC)'.

1b. Outline one activity that could be part of an appropriate cool-down for Curtis after his qualifying heat.

Question 1b.

Mark	0	1	Average
%	68	32	0.3

Command words – difference between outline and list.

Outline: Include a **brief description or key characteristic** of each point.
List : No explanation needed, just the items.

Students were required to outline an activity that could be appropriate for a cool-down.

Specificity appears more than any other principle throughout the course – cool-down **activity needed to be sport specific**.

Acceptable answers included:

- kayak at lower intensity
- static stretch – holding an arm across the body.

Dynamic stretch not appropriate (more for warm-up)
Students undertaking training and reflections would have benefitted by knowing difference between active and passive stretching (warm-up & warm-down)

Common issues included:

- listing rather than outlining a response
- not linking the response to the correct activity context (kayaking) – some students provided 'jogging' as a response, which is not specific to this activity
- not providing a specific example of a static stretch.

Read the question carefully/purposefully – a paracanoiest would struggle to jog

ew with links to Teaching & Learning

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1c. Predict whether Curtis's oxygen consumption would have reached a steady state during his kayak event. Justify your response.

How is steady state observed / felt? – we all know it's when oxygen supply meets oxygen demand = **relatively constant heart rate, respiratory rate, etc.**

- **Can someone be in steady state when they go for a 50m jog?**

- **Learning through practical experiences** – short and intermediate interval training = no steady state. HIIT – steady state during 'recovery' / 'float', but then above LIP during surges

  Continuous training characterized by periods of steady state, following initial O_2 deficit

  20m shuttle run test – look at oxygen deficit, steady state and EPOC (done via smart watch/wearable technology)

Similar to previous VCASA question which showed heart rate at various stages with 3 consecutive reading within 1-2 bpm.

Question 1c.

Mark	0	1	2	3	Average
%	23	15	33	28	1.7

Students were required to use the stimulus to predict whether Curtis McGrath, an Australian paracanoeist, would have reached steady state and justify their prediction.

Responses that scored highly linked the performance characteristics of the event (intensity and duration) to their justification.

The following is an example of an ideal response:

Curtis is not likely to reach steady state due to the 41.708 second duration of the event. As a result of this short-duration maximal-intensity effort, the anaerobic systems are likely the major contributor, indicating that oxygen supply does not equal demand and Curtis is in oxygen deficit for the duration of the event.

Question 1d.

Mark	0	1	2	3	Average
%	3	14	39	45	2.3

Students were required to identify resistance training protocols for a selected exercise to improve muscular power for Curtis.

Acceptable exercises included:

- chest press
- lat pull-down
- seated row.

The correct answer for repetitions is three to ten (or a number within this range).

The correct answer for % 1RM is 30–70% 1RM (or a percentage within this range).

d. Upper-body exercises as part of a resistance training program could help improve Curtis's muscular power.

Complete the following table by including resistance training protocols (repetitions, % 1RM) for one suitable exercise to improve Curtis's muscular power. 3 marks

Exercise name	Sets	Repetitions	% 1RM	Speed of contraction
	3			*fast*

Do not be guided what the different textbooks, strength and conditioning manuals, etc. have printed – VCAA have clearly stated acceptable ranges of sets, reps, resistance AND rest for resistance training.

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1e. An intermediate-interval training program undertaken in the lead up to the Paralympics could have improved Curtis's lactate tolerance. Explain how an improvement in lactate tolerance could have contributed to Curtis's performance in his kayak event.

Question 1e.

Mark	0	1	2	3	4	Average
%	32	20	20	19	8	1.5

To be awarded full marks, students were expected to explain how an improvement in Curtis's lactate tolerance could have contributed to his performance in his kayak event.

Responses that scored highly explained how training that focused on the anaerobic glycolysis system produced the adaptation of increased muscle buffering capacity, which would result in an increase in lactate tolerance.

Common issues included:

- confusing lactate tolerance with LIP
- not providing a physiological reason/adaptation (increased muscle buffering capacity) that could explain an increase in lactate tolerance. Unit 4 Area of Study 2 is clear in identifying performance improvements such as an increase in lactate tolerance and requires students to explain adaptations that account for these outcomes.

The following is an example of an ideal response:

> During intermediate interval training, there would be a large contribution from the anaerobic glycolysis system, which results in an accumulation of metabolic by-products. This training would increase Curtis's muscle buffering capacity, meaning he can withstand the impact of high lactate levels and can maintain his force production while kayaking, finishing in a faster time.

LIP = Aerobic
Lactate Tolerance = Anaerobic

Students need to know the 'what, where, why' when it comes to adaptations.

LIP = **increased oxygen availability to muscles** mainly brought about by increased mitochondria density (**muscles**), but also linked to factors that increase VO_2 max. Why – what type of training promotes these changes and what sports/activities would this be most beneficial in?

LA Tolerance = **ability to continue performing above LIP** whilst H+ is accumulation (**muscle buffering**). Why - – what type of training promotes these changes and what sports/activities would this be most beneficial in?

Great prac - 800m (why can some students keep running at higher intensities aerobically (steady state), whilst others slow down and **why can't final sprint to finish line be sustained by some for greater than 50m whilst other can do so for 200+m?**

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Monique

Question 2ai

Mark	0	1	Average
%	10	90	0.9

The correct answer was 'cognitive'.

Question 2aii

Mark	0	1	Average
%	15	85	0.9

The correct answer was 'continuous'.

i. Identify the stage of learning that Mick was in when he first learnt the skill of using crutches to run.

ii. Classify the skill of running with crutches by circling the correct option below. discrete serial continuous

2b. Evaluate the most appropriate practice distribution for Mick when he first learnt the skill of running with crutches. Refer to the stage of learning and the skill classification from part a.i and part a.ii in your response.

Question 2b

Mark	0	1	2	3	4	Average
%	49	20	17	11	3	1.0

To be awarded full marks, students needed to evaluate the most appropriate practice distribution for Mick, referring to his stage of learning and type of skill in their response. The most appropriate practice distribution was distributed practice.

The following is an example of a high-scoring response:

> *As Mick is a cognitive learner when he first learnt to walk with crutches, distributed practice, which is shorter more frequent practice, would be most appropriate. This ensures he can experience more recovery periods as well as receive more frequent feedback to improve quickly. As this is a continuous skill he is likely to fatigue quickly and so distributed is more appropriate than massed which is fewer but longer practice sessions as that would fatigue Mick more and give him less opportunity for feedback.*

Many responses incorrectly evaluated type of practice (part or whole) or variability of practice (blocked or random). Students are reminded to review the categories of practice to ensure they are addressing the requirements of the question.

Emphasize categories of practice:

Distribution (mased / distributed), type (part/whole) & variability(blocked or random).

Recall that **distributed = within a session or within a weekly schedule**

What pracs are happening across the State?

Advantages and disadvantages of each type of practice - physiological and cognitive

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2c. Goal setting is a psychological strategy Mick could have used when learning to run with crutches. Explain how the use of goal setting could have improved Mick's participation, skill development and performance in the marathon.

Question 2c.

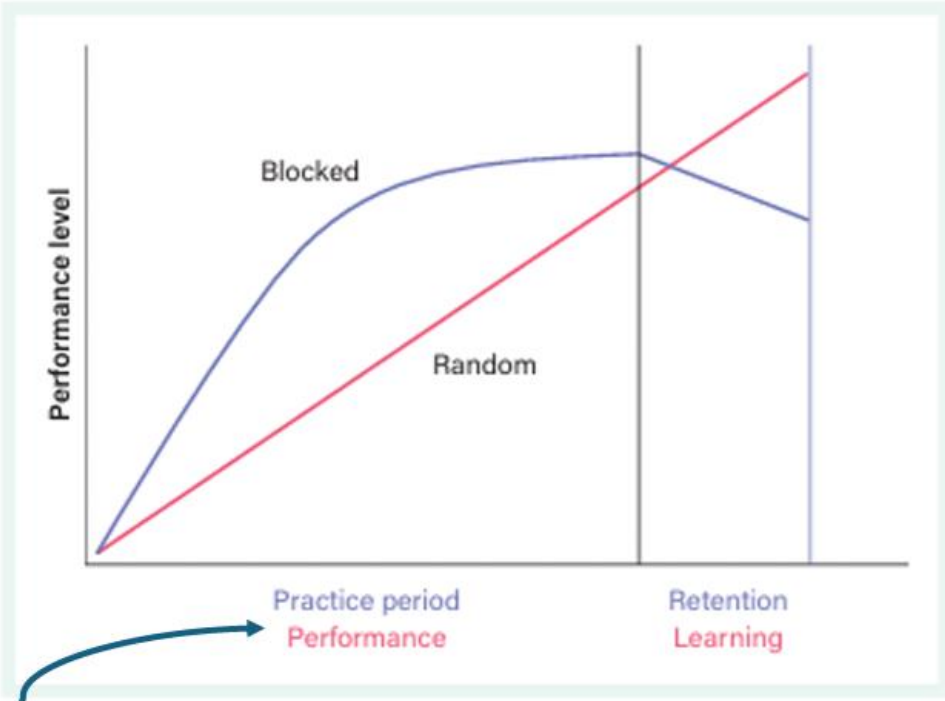
Mark	0	1	2	3	4	Average
%	5	8	10	22	55	3.1

To be awarded full marks, students needed to explain how the use of goal setting could have improved Mick's participation, skill development and performance.

Responses that scored highly linked goal setting to an increase in Mick's motivation, which would increase his participation and opportunity for practice, in turn increasing his skill development and performance.

The following is an example of an ideal response:

> Goal setting involves setting specific goals or outcomes to be achieved through his practice, which can motivate him to participate to achieve his goals. This participation leads to an increase in practice, which leads to an increase in motor skill development when running with crutches. This would lead to an increase in performance, which would further motivate him to participate.



The Goal-Setting Performance Cycle

- **1. Goal Setting (Input):** Specific, challenging, and personal goals are set, creating a clear target.
- **2. Increased Motivation (Mechanism):** Clear goals provide direction and enhance self-efficacy, transforming needs into effort.
- **3. Increased Participation (Action):** Higher motivation leads to active engagement, persistence, and focus on task-related activities.
- **4. Performance Improvement (Outcome):** The increased participation translates into higher productivity, with studies showing 10–25% improvements.
- **5. Feedback Loop (Cycle):** The resulting performance is measured, providing feedback that informs the next, often higher, set of goals

Think back to MCQ 18 but this time focus on practice period – how does motivation increase practice frequency/period?

Describe a nutritional strategy that Mick could have used during the marathon to delay fatigue for this event.

Question 2d.

Monique

Mark	0	1	2	Average
%	62	23	15	0.6

Students were required to describe a nutritional strategy that Mick could have used during the event to delay fatigue.

Responses that scored highly were able to link the consumption of carbohydrates to the delay of fatigue due to glycogen depletion.

The following is an example of a high-scoring response:

Mick could consume carbohydrates during the event to provide an alternate source of fuel for the muscles, delaying the risk of fatigue due to glycogen depletion.

Common issues included:

- referring to carbohydrate loading, despite the context being 'during the event'. In this study design, students need to be able to describe nutritional strategies that enhance performance and recovery and delay fatigue prior to, during and following an event.
- using the term 'carbs', which is not an acceptable abbreviation for carbohydrate
- referring to glycaemic index (GI) ranking, which is outside of the scope of the study design.

Needed to describe carbohydrate intake **DURING MARATHON** which delays glycogen depletion and thus fatigue.

Make sure only accepted abbreviations are used – "carb" – not accepted; CHO = accepted

Every second response described carbohydrate loading - students default to this as a means of improving endurance (2+ hr performances) – READ QUESTIONS CAREFULLY.

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Fifteen male lacrosse players competing in a national championship were monitored during an 80-minute match (played in quarters) using global positioning system (GPS) monitors. The table below shows the movement patterns and average playing time by position.

Activity analysis data	Midfield	Attack	Defence
playing time (min)	36	48	59
walk (m)	127	172	194
jog (m)	1064	1149	1123
run (m)	1137	1169	967
sprint (m)	199	143	139

Question 3a.

Mark	0	1	2	Average
%	59	26	15	0.6

To be awarded full marks, students needed to clearly explain the purpose of an activity analysis.

The following is a sample response:

> *An activity analysis can aid the coach in determining the physiological requirements of lacrosse to determine the relevant fitness components, energy systems and muscle groups. This allows the coach to select fitness tests and design a specific training program for players.*

A common issue was explaining that an activity analysis could be used to identify strengths and weaknesses of an athlete.

Students are reminded that the purpose of an activity analysis (identifying the physiological requirements of an activity) and the purpose of fitness testing (identifying strengths and weaknesses) are different.

3a. Explain the purpose of an activity analysis for a coach.

What's the purpose of a QMA – preparation stage?

Activity analysis and fitness testing confused by students

AA = physiological requirements, fitness components & energy systems

FT = fitness profile = strength and weakness **(most common error in marking)**

Constantly ask open ended questions during pracs –

- **why are we releasing the ball at this angle?**
- **why are we doing this set of tests?**
- **why should you be running at RPE 8 and ot 9?**
- **what happens if you keep this training up for 6 months?**
- **what is the the difference between……?**
- **how are these two different to each other**

- **Provide students with plenty of practice interpreting dat tables, graphs, etc..**

3b. Identify an additional type of data, apart from that provided in the table on page 12, and outline how this could be used as part of a coach's activity analysis.

Students were required to identify an alternative type of data and outline how this could be used as part of a coach's activity analysis.

Accepted types of data included:

- skill frequency
- heart rate
- work-to-rest ratio (W:R).

A common issue was to identify a *method* of data collection (such as heart rate monitors or GPS), rather than a *type* of data.

Students are expected to undertake an activity analysis as part of the requirements of the study design and therefore will use a variety of methods of data analysis when doing this. However, when integrating their practical participation with their theoretical application, as per the study design, students are to analyse the types of data, not methods of collection.

The following is an example of a high-scoring response:

Collecting skill frequency data such as jumps can help the coach identify relevant fitness components and muscle groups required in lacrosse

Apart from, other than, additional to….

Common to INCORRECTLY see data collection methods AS options from students– exam pressure or didn't actually undertake an activity analysis as per study design??

3c With **reference to the data** in the table on page 12, analyse **the relationship between** the energy systems used during activity and recovery for lacrosse midfielders and defenders

Question 3c.

Mark	0	1	2	3	4	5	6	Average
%	9	14	23	26	19	8	1	2.6

Students were required to reference data to analyse the relationship between the energy systems used during activity and recovery for lacrosse midfielders and defenders.

Responses that scored highly were able to:

- reference all energy systems within the context of lacrosse midfielders and defenders
- identify the aerobic system as the greatest contributor, with supporting data
- use specific numbers from the data to support their explanation
- explain the energy system contribution using the key terms 'rate' and 'yield'
- compare rest times and the resulting difference in creatine phosphate (CP) restoration for the two positions
- use the information about rest time to compare the energy system contribution during work periods for the two positions.

Common issues included:

- writing a generic energy system interplay without comparing the two positions
- referring to the information without specific data references
- using terms outside the scope of the study design, such as 'dominant' and 'predominant', instead of accepted terms such as 'rate', 'yield' and 'contribution at varying intensities'.

This question was marked holistically :
H = 5-6 marks **rate,yield,intensity** common in this band
M = 3-4 marks
L = 1-2 marks **very little if any ref to data**

IMPORTANT : Question asks to consider energy system usage during the activity – many students discussed energy system fatigue despite not being asked for this – OK if used in context and to explain changing nature of e/system interplay.

Needed to refer to data – important that breaks (passive rest and bench time) used to restore CP and this system can be used again

Needed to compare both positions not just a generic discussion about energy system contribution during an intermittent activity

When setting SACs – chose case studies, & data analysis tasks - or use throughout coursework if choosing stuctrured questions (Why opt for structured questions? - specificity? ONLY if command words used effectively)

A lacrosse coach wanted to test the players' aerobic power and considered using either the Cooper 12-minute run test or the Yo-Yo intermittent recovery test.

3d. Evaluate the most appropriate test for the lacrosse players from a physiological perspective

Monique

Question 3d.

Mark	0	1	2	3	4	Average
%	20	9	23	29	19	2.2

To be awarded full marks, students were expected to identify that the Yo-Yo intermittent recovery test was the most suitable test. They needed to use their understanding of the concept of specificity to justify their selection and explain why the Cooper 12-minute run test was less appropriate.

Many responses used information from the stimulus correctly and displayed a strong understanding of the concept of specificity and the need to replicate movement patterns in test selection.

The knowledge required for this question should be developed through participation in an assessment of fitness and then applied through the information provided in the stimulus. In this study design, students are not required to know the methods of specific fitness tests.

Common issues included:

- a lack of understanding or recognition that, when evaluating two options, a comparison to the non-selected variable identified in the stimulus needs to be made
- not defending the selected choice with evidence or reasoning.

The following is an example of a high-scoring response.

The Yo-Yo intermittent test would be the most appropriate from a physiological perspective as it replicates the physiological demands of lacrosse. The intermittent nature of the test, with periods of walking and periods of higher intensity running is suited to the movement patterns and demands of lacrosse players, as they walk for 172m and run 1169m. The Cooper 12 minute run test doesn't reflect the intermittent nature of lacrosse as it is continuous, making is less suitable.

Specificity = replicates, mimics, mirrors, etc.

Note – because 2 options provided, must state why the 'other' / not selected test is not suitable

Students need to undertake an activity analysi and consider which fitness componeents & energy systems are significant and **how these can be assessed with tests that are most specific.**

Take students through several tests (no longer required to rote learn procedures) – unpack related key knowledge (other than fitness assessment):

- **Energy system contribution**
- **Fatigue**
- **Norms vs adaptations /training**
- **Psychological considerations - linked back to U3 AOS1**

3e. Based on the results of the fitness test, the coach identified a need to increase the VO2 max of the lacrosse players. Explain how an increased VO2 max would improve performance of the lacrosse players.

Question 3e.

Monique

Mark	0	1	2	3	Average
%	45	28	20	8	0.9

To be awarded full marks, students needed to use their understanding of VO_2 max to explain how it would improve the performance of the lacrosse players.

Responses that scored highly demonstrated an understanding that a high VO_2 max leads to an increased rate of energy production via the aerobic system, and described how this would enhance performance in lacrosse.

Common issues included:

- relying on generic language such as 'working at a higher intensity for longer' and not linking this performance benefit to the aerobic system
- not including reference to the context of the question, which was lacrosse.

The following is an example of an ideal response:

An increased VO_2 max increases the maximum amount of oxygen that can be taken up, transported to and utilised by the working muscles per minute. This increase allows for faster rates of energy production via the aerobic system, which means the lacrosse player can run at a higher intensity aerobically.

Must link VO2 max to improved LIP and aerobic power – **greater uptake, transport and utilization of oxygen** (not just 1 body system) – vital definition and thus understanding

'working harder for longer' suggests work above LIP and at VO2 max but not explicit enough

Need to explain how producing ATP aerobically at a faster rate improves lacrosse performance.

Again – difference between LIP and LA Tolerance

3e. Explain how one respiratory adaptation could contribute to an increased VO2 max.

Question 3f.

Mark	0	1	2	3	Average
%	37	26	31	7	1.1

Students were required to explain how an appropriate respiratory adaptation could contribute to an increased VO_2 max.

Acceptable adaptations were:

- increased surface area of alveoli
- increased size of alveoli
- increased pulmonary diffusion
- increase ventilation (max)
- increased tidal volume.

Some responses that used tidal volume did not show an understanding of the concept as an adaptation and did not link it to maximal ventilation and VO_2 max.

The following is an example of a high-scoring response:

Increased pulmonary diffusion increases the amount of oxygen that is diffused through the alveoli into the blood. This directly increases the uptake of oxygen which increases the availability of oxygen for working muscles, increasing aerobic ATP production and therefore VO_2 max.

Needed to identify correct RESPIRATORY adaptation – a-VO2 diff is not respiratory!

NB – Gaseous exchange occurs at lungs (respiratory) and muscles(muscular) so cannot be accepted

Tidal volume per se not great but if linked to increased ventilation contributing to VO2 max = OK

When explaining VO2 max ensure all 3 body systems that increase oxygen uptake (RESPIRATORY), transport (CARDIOVASCULAR), & utilization (MUSCULAR) are covered as a 'package' – how are these acute responses 'supercharged' via aerobic based training to achieve chronic adaptations?

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4a. Aryna can use resistance training to improve her muscular strength. As a result, Aryna's motor unit recruitment could be enhanced. Explain how increased motor unit recruitment could improve Aryna's performance.

Question 4a.

Mark	0	1	2	Average
%	26	26	48	1.2

Students were required to explain how increased motor unit recruitment could improve performance in tennis.

Responses that scored highly were able to demonstrate an understanding of the outcome of increased motor unit recruitment in the context of a tennis match.

The following is an example of a high-scoring response:

Increased motor unit recruitment allows more muscle to be used during contractions, increasing the force produced. This allows for more powerful tennis shots, making them more difficult to return.

Well answered: Muscular adaptations would have covered increased motor unit recruitment as well as increased fibre size and increased frequency of firing all leading to increased speed and power

4b. Explain how an increase in her muscular strength could increase Aryna's muscular power.

Question 4b.

Mark	0	1	2	Average
%	50	26	24	0.8

Students were required to explain how an increase in muscle strength could increase muscular power.

Responses that scored highly were able to demonstrate an understanding of the relationship between muscular strength, muscular power and speed by focusing on the characteristics of each fitness component rather than just definitions.

The following is an example of a high-scoring response:

Muscular power is the ability of the muscle to produce maximal force in the shortest time possible. It is a combination of speed and strength, therefore, as muscular strength increases peak force production, it will also increase muscular power.

Must link strength to power and how increasing one increases the other.

- **Greater force production**
When athletes becomes stronger (e.g., through resistance training), their muscles can generate more force.
- **More force available (to apply quickly)**
If the athlete maintains or improves movement speed, the increased force results in higher power output.

4c. Explain how the type of muscle fibre influences the production of speed as a fitness component.

Question 4c.

Mark	0	1	2	Average
%	46	33	21	0.8

Students were required to explain how a type of muscle fibre influences speed production.

Responses that scored highly were able to use a characteristic of their chosen muscle fibre type to explain how it influences the ability of the body or body parts to move from point A to point B in the fastest time possible.

Students were able to use either fast- or slow-twitch muscle fibres in their responses.

The following is an example of a high-scoring response:

Fast twitch muscle fibres increase speed as they contract faster, allowing the body to move from one place to another in the shortest time possible.

Keep it simple – slow and fast twitch fibres (don't worry about fast twitch a and fast twitch b, type I /type II)

What is it about FT fibres (characteristic) that contributes to production of speed/power?

Again – think about aerobic = endurance performance vs. anaerobic = power/speed performance and slow twitch and fast twitch fibres respectively

****Most students went with FT = speed BUT OK to use ST dominance leading to slower contraction speeds.**

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Monique

Question 4d.

Mark	0	1	2	Average
%	34	35	30	1.0

4d. Name one psychological factor that Aryna could have included in her training diary and explain how it might have benefited her during the competition.

Students were required to name a psychological factor and explain how it might have benefited Aryna during the competition.

Responses that scored highly were able to explain how Aryna would use the diary to alter or mimic the strategies in place to optimise the targeted factor.

Some students were able to identify a psychological factor but referred to how this might prevent overtraining, rather than the correct context, which was during the competition.

Acceptable psychological factors included:

- motivation
- stress/anxiety
- arousal
- concentration
- confidence
- sleep.

The following is an example of a high-scoring response:

Aryna could have monitored her arousal levels so she would be aware if her arousal levels needed to be promoted or reduced and could implement strategies to achieve optimal arousal to enhance her performance during competition.

Surprisingly poorly answered given many of these psych factors included in reflective folios (VCAA template)

Recording of psych factors provide trends and patterns associated with performance levels which can then be adjusted accordingly

Some students chose sleep but spoke about improved recovery, decreased feelings of RPE, improved reaction time, etc which are all **physioplogical benefits**

4e. Coaches should frequently adjust training programs to prevent boredom and keep the training enjoyable. State the training principle a coach is applying when they adjust a training program.

Surprisingly poorly answered:
Common to see '**variability**' (practice) instead of variety (principle)

Question 4e.

Mark	0	1	Average
%	47	53	0.6

Monique

The answer was 'variety'.

Many students wrote variability instead of variety. Variability is a classification of practice, while variety is a training principle.

Critique the effectiveness of this conditioning phase for improving Aryna's speed.

Question 4fi.

Mark	0	1	2	3	4	Average
%	34	20	18	25	3	1.4

Strength, weakness & modification to improve required
BUT : rote learnt partially effective, somewhat effective created problems for students = no marks

Students were required to critique the effectiveness of a training program to improve speed.

Responses that scored highly were able to correctly critique the program by:

- identifying a strength of the program
- identifying a weakness of the program
- making a recommendation to improve the weakness that had been identified
- using this information to determine that the program was not effective.

Some programs ARE simply NOT EFFECTIVE IF THERE IS NO WAY THEY CAN ACHIEVE STATED TRAINING GOAL (S)

The following is an example of a high-scoring response:

This program would not be effective in improving Aryna's speed. While the work period of 3 and 5 seconds is an appropriate prescription for short interval training to target speed, the intensity of 7 RPE is too low as she would be running rather than sprinting. To make the program effective for improving speed, the intensity should be increased to an RPE of 9–10.

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Reducing rest periods is one way of applying progression across Aryna's short-interval training program. Discuss the suitability of reducing rest periods as a form of progression.

Question 4fii.

Mark	0	1	2	3	Average
%	53	21	19	7	0.8

Students were required to discuss the suitability of reducing rest periods as a form of progression.

Responses that scored highly were able to identify that reducing rest periods is not suitable as it may alter the targeted energy system, therefore reducing specificity of the program.

The following is an example of a high-scoring response:

> *Decreasing rest would not be suitable as it alters the work to rest ratio and thus the targeted energy system. This could result in a loss of specificity of the program.*

Many responses suggested that reducing rest time would be appropriate to make the training program more difficult and elicit adaptations. If the response outlined that it could be appropriate as long as the targeted energy system didn't change and it remained specific, marks may be awarded.

Again – SPECIFICTY OF TRAINING TO GOAL!

How training loads increase matter!

Decreasing rest interferes significantly with major energy system trained by short intervals – marks for loss of specificity.

Rest periods for HIIT are critical depending on duration of effort and intensity – essential to refer to VCAA information:

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a. i. The diagram shows the characteristics of a ramp shot in cricket. List the stage of a qualitative movement analysis (QMA) at which a coach should identify the characteristics of a skill.

Constantly be referring to current sporting innovations and links to coursework in class – start, 'fun fact Friday', on exit from class – etc

Energy systems will remain energy systems, training principles will be the same but innovations in technique (gymnastics, skiing, soccer, hockey, etc… have great opening for biomechanics discussions.

Question 5ai.

Mark	0	1	Average
%	60	40	0.4

The correct response was 'preparation'.

a ii. Describe how a coach could use the other stages of a QMA to improve the performance of a ramp shot performed by an athlete.

Question 5aii.

Mark	0	1	2	3	Average
%	40	19	22	20	1.2

To be awarded full marks, students needed to describe how a coach could use observation, evaluation and error correction to improve the performance of a ramp shot.

Responses that scored highly described each stage within the context of the ramp shot.

The following is an example of a high-scoring response:

During observation the coach should watch or record the athlete completing the ramp shot. They should use the evaluation stage to determine strengths and weaknesses and errors in the shot. In the error correction stage, the coach can provide feedback and implement drills which target the errors observed, improving ramp shot performance.

…other stages (other than). The 4 stages will never change, nor will what happens at each – relatively easy question answered poorly by most.

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5b. Explain why the ramp shot could be more successfully performed against faster bowlers by referring to one relevant biomechanical principle.

Question 5b.

Mark	0	1	2	3	Average
%	59	13	13	15	0.9

To be awarded full marks, students needed to select a biomechanical principle and explain how that principle would allow the ramp shot to be more successful against a fast bowler. Many students were not awarded any marks due to selecting an inappropriate biomechanical principle.

Responses that scored highly identified and explained an appropriate biomechanical principle and described what a successful performance looked like when the principle was applied.

Acceptable biomechanical principles were:

- Newton's first law of motion
- Newton's third law of motion
- conservation of momentum
- impulse
- speed of release.

The following is an example of a high-scoring response:

The ramp shot could be more successfully played against a fast bowler due to the principle of conservation of momentum. This principle states that the total momentum prior to impact will be the same following impact. When the ball is bowled from a fast bowler it has greater momentum (velocity x mass) so the greater the momentum prior to impact, the greater momentum after impact. The ball is likely to travel further over the fielder's heads making it harder to stop.

No marks for simply just listing a biomechanical principle – hope and a prayer!

How does the principle apply to cricket BUT more importantly how does it lead to successful performance – in other words – why is the ramp shot being used rather than traditional cricket strokes

Summation of momentum = not relevant.

Provide students with exemplar responses (from peers, previous exams, etc..) – show them what highly awarded responses look like – get them to unpack responses and ask them to allocate marks for each 'bit' of response – where are the 3 marks awarded?

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Question 6a.

Mark	0	1	2	Average
%	3	43	53	1.5

The correct response for blood volume was 'decrease'.

The correct response for body temperature was 'increase'.

Question 6b.

Mark	0	1	2	3	4	Average
%	17	24	25	20	15	1.9

To be awarded full marks, students needed to analyse the data and use it to explain the most likely reason for the difference in race time with respect to fatigue mechanisms.

Responses that scored highly used the data to identify that thermoregulatory fatigue was the fatigue mechanism impacting the race times, and explained how the physiological process of thermoregulatory fatigue impacts performance.

Some responses confused thermoregulation with thermoregulatory fatigue. Students are encouraged to explore the differences in thermoregulation under a variety of environmental conditions.

The following is an example of a high-scoring response:

The winner of the Eugene marathon was faster than the winner of the Doha marathon due to temperature being lower, 16 degrees compared to 32 degrees. The athlete in Doha would likely have suffered thermoregulatory fatigue. This resulted in an increase in blood flow to the skin, away from working muscles to cool down. As there is less oxygenated blood to the working muscles to produce ATP

In the spaces below, state whether the acute response for blood volume and body temperature will increase, decrease or stay the same during the Doha marathon.

Year	Date	Start time	Location	Winner	Time (hr:min. sec)	Average temperature (°C) during the race
2022	18 July	6.15 am	Eugene, USA	Gotytom Gebreslase	2:18.11	16
2019	27 September	12.00 midnight	Doha, Qatar	Ruth Chepng'etich	2:32.43	32

Explain the most likely reason for the difference in the marathon race time of the winners of the Eugene and Doha marathons by referring to the relationship of this reason to the related fatigue mechanisms.

This is another contrast question – must consider both events/sets of data – elevated body temp leading to thermoregulatory fatigue = difference in time

How does sweating = lower blood volume = higher viscosity impact cardiovascular system and delivery of oxygen to working muscles?

How does redistribution of blood to skin (cooling mechanism) impact cardiovascular system and delivery of oxygen to working muscles?

Fatigue –teach cause and effect!

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Monique

Question 7a.

Mark	0	1	2	3	4	Average
%	35	15	11	17	21	1.8

To be awarded full marks, students needed to use their understanding of impulse to compare how bowler A and bowler B vary the distance of their bowls.

While applying the same amount of force. a. Compare how bowler A and bowler B use the biomechanical principle of impulse to vary the distance their bowl travels

Impulse = F x t. many students discussed height of release (a bending more, etc.)

Great prac – lawn / carpet bowls - apply same force but vary time of application – what happens?

Same for softball pitch – link to follow through, summation of momentum and speed of release

Responses that scored highly used the variables of impulse (force and time) within the context of the two bowlers to explain the different performance outcomes.

Forget about catching water balloons to teach impulse – heaps of sporting examples (vertical jump is brilliant to increase speed and decrease speed)

The following is an example of a high-scoring response:

> *Impulse = force x time and refers to the change in momentum of an object. Bowler B uses a longer arm swing increasing their impulse by increasing time over which force is applied. This increases the distance the bowl travels. Bowler A however, decreases their impulse by decreasing the time over which force is applied when using a shorter arm swing, meaning the ball travels a shorter distance.*

Compare A to B – this happens frequently and explain why performance improves.

Common issues included:

- discussing impulse being manipulated rather than increased or decreased
- saying that bowler B increased the force applied to the bowl
- not linking to the performance outcome of increasing or decreasing the distance the bowl travels.

- **Law of diminishing returns**
- **Frequency of training/practice**
- **Better sequencing/timing of body parts**
- **Intensity of training 75% vs.just below LIP (90%)**

Bowler B decides to change to a lighter set of bowls. However, on using the same arm swing, bowler B finds that their bowl is travelling too far. Use Newton's second law of motion to explain why this is occurring.

Monique

Question 7b.

Mark	0	1	2	3	Average
%	35	20	22	24	1.4

Students were required to use Newton's second law of motion to explain why, when bowler B changes to a lighter set of bowls and uses the same arm swing, their bowl travels too far.

Responses that scored highly applied the equation $f = ma$ to the context of the question and explained that, when the same force is applied to objects with a different mass, the acceleration will be different.

The following is an example of a high-scoring response:

> *Newton's 2nd law states that a force applied to an object will cause a change in motion (acceleration) in the direction of the applied force, directly proportional to the force and inversely proportional to its mass (f=ma). A decrease in mass of the bowls while applying the same force will result in an increased acceleration of the bowl and it travels too far.*

What are the 3 laws – definitions and what are a couple of sporting examples for each?

How does the law apply to the bowls example and what is the effect on performance/ distance travelled?

How does Newton's 2nd law apply to a cricket throw, tennis serve, hockey push, etc.. And what is the outcome of this on performance?

The modern pentathlon is a one-day event consisting of five disciplines: fencing, 200 m freestyle swim, equestrian showjumping, shooting and running. The shooting and running disciplines are combined to create the laser run event. At senior level, the laser run alternates between five high-intensity 600 m runs and four precise shooting rounds, requiring athletes to manage both physical exertion and mental focus under fatigue. Unlike a single-event athlete, such as a 3000 m running specialist, modern pentathlon athletes must compete in multiple events across a single day, including the final event, the laser run.

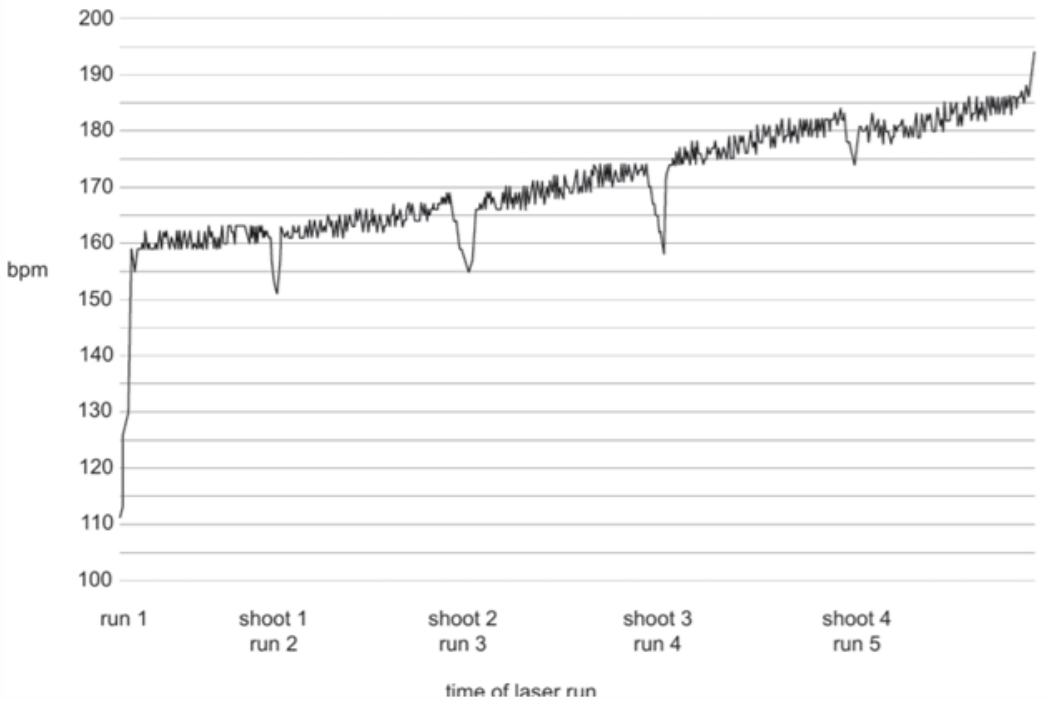
Question 8

Mark	0	1	2	3	4	5	6	7	8	9	10	Average
%	11	9	14	18	19	13	8	5	2	1	0	3.4

Example of elite athlete times for each run and shooting round during the laser run

Segment	Activity	Time (min:sec)
lap 1 – 600 m	running	1:52.33
shoot 1	shooting	8.20
lap 2 – 600 m	running	2:06.60
shoot 2	shooting	13.00
lap 3 – 600 m	running	2:15.36
shoot 3	shooting	10.50
lap 4 – 600 m	running	2:16.35
shoot 4	shooting	8.40
lap 5 – 600 m	running	2:16.04
	Total	11:26.78

Typical heart rate data (bpm) of an elite athlete during the laser run



Session Title: VCE PE Units 3 & 4 Exam Review with links to Teaching & Learning

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The following is an example of an ideal response:

The modern pentathlon alternates between elevated heart rates during 1.52–2.26 minute runs and brief decreases during the laser-shooting phases. Both components benefit from arousal regulation strategies and aerobic training, as the aerobic system (large yield) is the major energy provider across the 11.26 minute event.

At the start of each run, the athlete rapidly accelerates by increasing motor unit recruitment. Positive self-talk or cue words can optimise arousal for this explosive effort. Early in the run, oxygen demand exceeds supply despite acute responses such as increased tidal volume and heart rate working to increase oxygen consumption. This is reflected in heart-rate data rising from 110 bpm to ~160 bpm in run 1, indicating a period of oxygen deficit and greater reliance on the anaerobic systems (ATP–CP and anaerobic glycolysis).

Although heart rate continues to rise and the athlete does not reach steady state, the aerobic system remains the major contributor. Improving aerobic power through sport-specific training such as long-interval training would increase the rate of aerobic ATP production and mimic the duration and intensity of the run segments. To gain these adaptations, the athlete must train within the aerobic zone (70–85% HR max.) and apply principles such as adequate frequency (e.g. three sessions per week).

Before shooting, the athlete needs to rapidly reduce arousal to enhance precision. As energy demand drops and heart rate decreases, strategies like slow, controlled breathing help lower arousal and extend the time between beats, improving accuracy. During this short low-intensity window (e.g. 8.20 seconds), the aerobic system begins to restore CP, but insufficient recovery time means CP is not fully replenished, increasing reliance on anaerobic glycolysis at the start of the next run.

Only make links and integrate areas under consideration where appropriate – don't force square pegs into round holes!

NB – Great links to data throughout

SPECIFITIY of training to energy demands and performance benefits

NB – each area for consideration not dealt with in isolation!

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MANY THANKS

Make PE a positive part of your life!

Your reflections?

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