SPORT SCIENCE (SPT315113)

GENERAL COMMENTS

The overall consensus of the Marking Panel was a positive endorsement of the continuing theme from the previous paper that enabled candidates more flexibility in providing answers to a given scenario, based on their broad knowledge rather than just their ability to recall specific facts and where the ability to justify a chosen answer becomes a more important factor. It was also considered that the paper was a fair one, which gave all candidates the chance to demonstrate their knowledge and understanding of the course, to reflect their internal ratings and achieve an award commensurate with their abilities.

The nature of this style of paper also seems to assist with candidates’ ability to complete the paper within the time limit, as there continued to be fewer questions left unanswered.

On the theme of pleasing trends, it was noteworthy that fewer candidates seem to be writing in pencils, heeding the advice given over repeated years. Such a practice presents the potential for the paper to be easily amended.

On the flip-side; in an age of increasing digital presentation of work for assessment, many candidates would not seem to be getting as much practice of handwriting as a skill. This becomes an even bigger issue as they near the end of a 3 hour exam, and their writing can become difficult for Markers to read, negatively impacting upon their results if the writing degenerates to the point of illegibility.

Candidates wishing to achieve at higher levels are again reminded to ensure they use the appropriate, relevant and specialised terminology whenever the opportunity presents itself. Conversely, candidates are reminded that there is a limited range of acceptable abbreviations and acronyms suitable for exam use (eg: bpm, RHR, MHR, SMARTER, FITT, etc) where the use is related to the specifics of the question. However, individual acronyms and abbreviations developed by individuals or classes to help prompt memory, may not be suitable and may cause marks to be deducted if they are unknown to the Marker.

Perhaps understandably so, a continuing trend was noted; where many candidates enter the exam with a clear strategy in mind, based on their internal ratings and what is required of them to achieve the award for which they are striving. This is most often reflected in the standard of criterion 5 answers (questions 5, 10 and 15), where the discrepancy between internal and external performance is often the most pronounced. The justification for such a strategy is the knowledge that a ‘satisfactory’ or ‘commendable’ achievement can be obtained while still getting a ‘c’ on this criterion, or a ‘high’ achievement getting a ‘c’, if the performance on other criteria is sufficient.

Such a practice is potentially fraught with danger as candidates may not be able to perform to the required standards in the other criteria and are then left with no back up plan. Additionally, the marks needed for any given rating vary from year to year and criterion to criterion and it cannot be recommended to try and “guess” what mark will be required. Candidates would be strongly encouraged to prepare themselves to answer ALL questions, to the best of their ability, even if that means only to a minimal standard.

Perhaps as a result of the strategy just discussed, there continues to be only a small number of candidates whose answers to criterion 5 questions reflect the highest standards. However, one of the most pleasing aspect of this year’s exam was the comment from many Markers that the baseline standard of many candidates attempting criterion 5 questions has improved. It is hoped that this reflects teachers and candidates familiarising themselves more with the actual criterion standards and using the exemplars for each rating as provided in the solutions to provide a structure to answer questions which makes it easier for teachers, candidates and Markers alike.
Unfortunately, concerns are still being noted by Markers at the general lack of familiarity with the “techniques” needed for performance in an exam setting. Such concerns remain a staple in previous reports but will be stated here again, from a positive perspective.

For candidates wishing to perform well, they would be advised to understand and address the following issues:

write legibly, using appropriate terminology, in black or blue pen.

possess the ability to manage time effectively, knowing how much time is to be allocated to each question/booklet.

understand that where an answer and a justification are required that a greater weighting will be given to the justification than simply giving the answer; so always try to give detail in support of answers.

demonstrate an ability to carefully read and correctly interpret a question, which includes understanding the different requirements of cue words such as identify, outline, discuss, explain, compare and contrast, to name just a few; as well as the context against which the answer is to be framed.

In the case of criterion 4 questions (4, 9, 14) it means using data, and references to it, in support of your answers; making answers as accurate as they can be, and; using units where they are stated.

In the case of criterion 5 questions (5, 10, 15) it means knowing basic things such as: the relevant core areas to be addressed; the required direction and perspective of the question; the specifics of the athlete involved and their sport. It also means understanding how such questions are marked, which will be set out below.

In the interests of ensuring a greater understanding and consistency on criterion 5 questions, the Guide used for marking is as follows:

The 6 marks for each link be allocated along the lines of up to 1 mark for an appropriate and relevant link; up to 2 marks for appropriate theory (1 mark for each core), and up to 3 marks for the application and relevance of the link and theory to the specifics of the question.

0 marks be awarded for an INTRAreationship link, ie — where a link goes from one aspect of Phys/Skill/Psych to another from Phys/Skill/Psych.

0 marks be awarded when there is no clear establishment of any link/connection/interrelationship between the given theory from the two chosen core units; despite the theory for each core being appropriate to that aspect.

A maximum of 1.5 marks be allocated for an Interrelationship between the WRONG CORE areas (eg- Phys and Psych, when it should be Phys and Skill).

A maximum of 3 marks be allocated for links not answered from the correct PERSPECTIVE ie should have been answered in a positive sense but has been done negatively, or vice versa. *(This is especially relevant for Questions 5 and 10, which may have been interpreted as negative, when the answer calls for a positive link)*

A maximum of 3 marks be allocated for links which are written in the wrong DIRECTION ie the question expressly calls for links from one core to another eg from Phys to Skill, not Skill to Phys *(This is especially relevant for Question 5, which must go from Phys to Skill)*

A maximum of 4 marks be allocated for a second link where the SAME THEORY that was used in the first link is repeated. (NOTE: you can repeat the area but with different theory, eg: SA goals in one link and MRT the other, or Int/Ext motivation in one link and SDT-CAR, in the other link).

These Guidelines should be used in conjunction with the standards statement for criterion 5.
PART 1 – EXERCISE PHYSIOLOGY

QUESTION 1

Generally this question was answered well with easy marks being given for simple responses, particularly in the early part of the question.

a) (i) There was some confusion as to whether the correct answer was the aerobic or Lactic Acid system. A not insignificant number of candidates had one answer before crossing it out and changing their mind; some did this twice!

(ii) Generally handled well, although some candidates gave a by-product related to the wrong system based on their answer to the previous question.

(iii) Generally answered well, although many candidates listed multiple answers when only a predominant fuel source was called for. Many also listed fats, which would not be correct.

b) (i) While handled reasonably well by many candidates, there were some issues about describing VO2 Max as the “highest O2 attainable”, or only referring to it as relating to O2 uptake, rather than consumption or utilisation. Many also confused CVE as being similar to VO2 Max, and relating it to the utilisation of O2, when it is actually about the ability or effectiveness of the heart and circulatory system to supply blood to the muscles for extended periods of time.

(ii) Most candidates were able to correctly identify an appropriate training method, however, many then described the actual method, rather than addressing the requirements of the question by explaining how it could improve VO2 Max; or simply repeated what the question asked, without actually stating how it achieved the increase.

c) (i) There appeared to be some confusion over what this question was asking as a range of answers were given; including answers which did not relate back to the answer given in a) (i) as required.

(ii) Again, the interpretation of the wording of this question caused some confusion for a number of candidates, as they gave answers related to the “energy continuum”, or simply the notion of “ATP splitting and resynthesis”, rather than specifically describing the process of how the energy is produced in the system identified.

QUESTION 2

a) Answered well by most candidates, although many still get confused and mix up the colour with the type.

b) Those candidates who could not describe the specific causes of fatigue gave general descriptions of what fatigue was or described vague causes, rather than those which had been taught in the syllabus. In addition, many candidates described fatigue as being caused by the depletion of ALL fuel stores (which is virtually an impossibility), rather than focusing on the fatigue caused when just the glycogen stores are depleted.

c) Too many candidates confused the concept of “glycogen sparing” with “carbohydrate loading”, stating that it related to filling up the bodies stores of glycogen to prevent them from running out. Better answers related it to the ability of the body to use fats as a fuel source earlier on in the event, and at a higher % of MHR, allowing the athlete to delay the use, and possible depletion of, glycogen stores; thus allowing them to work at higher intensities and for longer times, later into the event.

d) (i) While many candidates were capable of listing 2 relevant chronic training effects, many were not able to explain “why” these occurred, from a physiological perspective; with many describing “what” caused the adaptation, meaning their answer became very similar to that given in the subsequent question. Unfortunately, many candidates did not read the question carefully enough and gave answers which were related to the respiratory system, and not the cardiovascular system as required.

(ii) The majority of candidates used the chronic effects of cardiac hypertrophy, decreased HR and/or increased SV. Those who did generally found it easier to show the relationship between these factors by linking to the concept of Q=HR x SV, where Q generally remains unchanged at rest as the decrease in HR is compensated for
in the increased SV. Some candidates failed to relate their answers to when at rest, and instead talked about what happened during exercise.

e) Generally answered quite well. Better answers didn’t just talk about overtraining being about too much work, but rather the imbalance between work and rest. Many candidates also listed psychological symptoms, such as loss of motivation, depression, etc rather than physiological symptoms as required.

QUESTION 3

a) Most candidates coped well with this question, given the wide range of answers that were able to be used. Better answers not only explained what the component involved but also demonstrated how it related to the specifics of the sport. Some candidates did not differentiate between strength, power and speed as well as they could have, while others confused components of fitness with training principles.

b) Generally answered well, although better answers mentioned the fact that interval training can be used to develop all energy systems and that the rest interval can be either active or passive, depending on the intensity of the work being done. Some candidates misinterpreted “variables” as being different ways to do the training, as in applying the training principle of “variety”, rather than referring to how the structure of the workouts or the number of sets and reps could be adjusted.

c) Generally answered well. Again, some candidates confused “Training Principles” with “Training Methods”.

d) Far too many candidates failed to grasp the distinction between “physiological” strategies for recovery with those which are “regenerative”, and included answers about actions such as CWI, CWT, massage, etc. Many others also mentioned nutritional strategies, which do not really fall into the appropriate category either. Some candidates also discussed an active recovery, while incorrectly referring to it as a “passive” recovery; while others mentioned “CHO loading”, which is done prior to an event, and can, therefore, not be a means of recovery. Better answers actually described the chosen method, as required, rather than simply stating why that strategy would be beneficial.

e) This question was not answered as well as others. Many candidates grasped at straws by simply repeating the information contained in the actual question itself. Some answers described why the process of EPOC is needed at great length, without then going on to answer the remainder of the question and describing the physiological processes which occur in both the alacacid and lactacid phases.

QUESTION 4

It was pleasing to note that few marks had to be deducted for candidates failing to use the relevant units when referring to the data, although far too many candidates are still not using figures from the graphs to support their answers.

a) Generally answered well, although many candidates were not as accurate with the lactate value for Athlete A as they should have been. Also, far too many candidates failed to properly read the question and only gave lactate values for both athletes, and did not provide the maximum power outputs.

b) Answered very well by almost all candidates.

c) Some candidates interpreted this question as a compare and contrast question and not only gave values for both athletes, but stated who did better and by how much, although this wasn’t necessarily required. Better answers focused on the relationship between BL and PO at start, LIP and exhaustion instead of just a single point.

d) A number of candidates interpreted an “extended time” as being several weeks of training, rather than during the same test as was intended; suggesting that such ‘training’ would result in them increasing their LIP. Many others failed to recognise that 170 W was above the Athlete’s LIP, and incorrectly stated that if the PO remained constant, the Athlete would achieve a ’steady state’. Better answers provided the relevant data to show that at 170 W, Athlete A was above their LIP and noted that they would still exhaust themselves, but that it would take longer than noted on the graph where intensity continued to rise.

e) The biggest issue with this question for a great number of candidates was their answering of the question from the wrong perspective. This meant they either stated which athlete was trained, rather than untrained as
required; and/or the evidence given to support who the untrained athlete was, was based around the reasons why the other athlete was trained! A number of candidates thought “B” was untrained because their graph was more irregular, when, in fact, this acted as evidence for their degree of training. Better answers recognised that Athlete A’s PO at exhaustion was still below Athlete B's starting PO, with a BL that was 7.8 mmol/L higher!

QUESTION 5

As is mentioned every year, questions related to Criterion 5 tend to be those which candidates find most challenging. One of the pleasing aspects this year was that fewer candidates failed to simply attempt this question than had in the past. Also, for many of the candidates at the “C” level, their answers seemed to have better links and structure. However, the sporting scenarios in this question presented a challenge to many as they found it difficult to relate the theory to the sporting skills of hurdling and sculling; especially with regard to either the sub-routines, or the aspects which needed to be selectively attended to.

It continues to remain abundantly clear that many candidates still struggle to grasp the concept of relating theory across different core areas, as they seem unable to show the effect one aspect can have on another. Some of the links which were suggested were completely implausible in general, or not realistic, given the specifics of the scenario.

Better answers not only stated what the theoretical concept was and how it may be useful, but explained how it may have been developed specifically for the 400m hurdles, or single sculling; whether it related to aspects such as LIP, Power, Muscular Endurance, or Practice Method.

PART 2 - SKILL ACQUISITION

QUESTION 6

On the whole candidates handled this question quite well with overall higher marks than the other short questions in this section.

a) Some candidates forgot to relate the information processing steps to the skill they had chosen. A large majority chose catching a ball.

b) Better answers looked for factors impacting on learning like the quality of instruction and practice. There was some confusion with gender, with too many candidates stating that Males learn or “pick things up” quicker than females. This is not the case, unless qualified by stating that certain skills are more suited to one gender or another, and justifying which one and why.

c) Better answers methodically went through the general categories of: preparation, force production, critical instant (eg - contact/release/impact) and follow through. Eg. Grip, stance, tracking, backswing, forward swing, point of release, follow through. Many candidates left critical information out of their subroutines. Eg. A throw needs a release and this was left out of some subroutines. And a Tennis serve needs a ball toss. Best answers chose a discrete and not a continuous skill.

d) i) Candidates had good overall understanding of the cognitive learner

ii) The best answers looked for distinguishing features of this stage and didn’t resort to simply choosing the same elements and stating that they had improved a bit.

e) The best answers justified distributed, part, drill and why they were relevant to learning new skills rather than just describing the type of practice.
QUESTION 7

The knowledge regarding memory was not that strong making this question challenging for many candidates. Given that the memory question accounted for half the marks for the question, it made overall scores much lower for this question.

a) With 4 things to remember, recall and relate to an example for each of the three memory sites very few candidates managed to remember everything and get the full 6 marks. Long term memory had the best understanding and application.

b) Candidates applied this quite well

c) Many candidates left this blank! Many others just stated what Hick’s Law was and found it very difficult to relate the concept to memory.

d) Most candidates mentioned that spatial anticipation was “WHAT” was predicted to occur and could link this to watching video. However, most found it harder to link the video to the PRP, although most candidates did have a go at this.

QUESTION 8

Unfortunately many candidates simply listed a SPORT rather than a skill. E.g. BASKETBALL or GOLF or TENNIS were common responses. Many candidates struggled with this question.

a) i) Better answers were able to relate the question to the skill they chose. Some still just wrote theory in isolation.

   ii) This was confused by several candidates who described the process of videoing and breaking down subroutines only.

b) This was done very well.

c) Applied well.

d) Several candidates confused Newton’s Laws, giving responses related to the First or Third Laws, rather than the Second, as required.

e) Overall quite well answered.

QUESTION 9

The candidates did quite well on this question.

QUESTION 10

- Several candidates only provided one link

- This question required answers to be given from a specific direction, namely, from Psych to Skill. Consequently, there were many errors in the direction of links, where skill was impacting on Psych with the most common error being that NK’s negative feedback from the crowd cause a drop in confidence.

- Some candidates still gave INTRA related links. For example, stating how his anxiety/arousal negatively impacted on his confidence; OR, NK’s drop in motivation/amotivation meant that he wasn’t concentrating in the correct attentional dimension.

- The question also required candidates to write their links from a negative perspective. Some candidates tried to “FIX” NK’s problems and say what he needed to do to improve, hence writing from a positive perspective, which cost them marks.

- Some candidates are still only ‘listing’ the link with arrows; without any supporting sentence or explanations.

- There was some incorrect interpretation that “over arousal” issues are due to “anxiety”, when this is not always the case.
• Unfortunately, far too many candidates tried to link the “stages of learning” to the scenario, which is completely inappropriate for an elite athlete, especially within the confines of a single match.

• It was evident that some better candidates understood how best to structure and set out their links, based on following the marking scheme and exemplar answers.

**PART 3 - SPORT PSYCHOLOGY**

**QUESTION 11**

a) A number of candidates didn’t include performance as part of the answer. They only talked about arousal and optimal arousal. Weaker candidates didn’t provide a clear explanation of how arousal impacts performance; rather they just stated that the Inverted U Hypothesis show a relationship between arousal and performance.

b) Better answers included fine skills require precision thus require lower optimal arousal and gross motor skills use larger movements and thus higher optimal arousal levels. Many candidates interchange ‘high’ arousal with ‘optimal’ and these can be quite different concepts and needed to be explained more clearly.

c) Including optimal arousal in the question added a different element to the question. Better answers were in the form of providing a coping strategy in the form of a backup plan or a coping with pain strategy of the sport for prior to the competition (Pre-competition strategies) and during the competition (competition strategies).

d) Generally well answered. Some candidates did not specify music to raise arousal levels. Better answers included some detail rather than listing a response which was not always clear.

e) A lot of candidates left out the ‘cognitive anxiety’ component from their answer. There appeared to be limited understanding from many candidates with regard to the “Catastrophe Theory”, with many unable to differentiate it from the “Inverted-U Hypothesis”. Very few candidates gained full marks for this question.

**QUESTION 12**

a) A mix of answers here including positive, negative, intrinsic and extrinsic. All acceptable with appropriate justification. Better answers were directly related to the statement in the question, rather than providing general statements which didn’t relate to the image.

b) A lot of candidates did not have necessary detail and just said it would improve self-confidence. A number of candidates did say that it would negatively affect self-confidence which was acceptable, with an appropriate justification.

c) A lot of candidates just included the two antecedents with no reference to self-efficacy, particularly the concept of it being situational self-confidence. Very received full marks.

d) i) A lot of candidates described attention in a sporting context without referring to a sporting situation/example which discussed an appropriate attentional style.

ii) Similar to d) i), a lot of candidates described how attention can change without referring to shifting between two different attentional styles. Better answers demonstrated a clear understanding of the two chosen styles through their explanation of the examples given and how a player shifts between them.
QUESTION 13

a) (i) (ii) (iii) Some candidates were able to describe how each of self-talk, mental rehearsal and concentration could positively and negatively affect sporting performance but a lot left out necessary detail of what those actual terms were. Other Candidates often left out how each component + or – impacted performance and were very general with their explanations. Candidates were NOT required to do a positive impact and a negative impact.

b) Most candidates were able to identify three benefits of goal setting. A number of candidates unfortunately only listed and didn’t outline the benefit for the extra marks.

c) Most candidates were able to identify three guidelines regarding goal setting but a lot failed to apply them appropriately to a specific athlete and outline how each guideline would benefit that athlete. Unfortunately, many candidates provided theory relating to the benefits but it was not relevant to answering the question.

QUESTION 14

Better answers referred to information in the question. For example: all three athletes had beginning fitness levels, height and weight; Round 1 internal motivation only, round 2 athletes competed against each other and round 3 $5000 and family and friends watching. Candidates who explained how things affect motivation and were able to apply to the results received best marks.

Weaker candidates were not clear with their use of language ie while in some instances, an increase in scores from the table was an improvement (such as the Beep Test and Vertical Jump) others were not (such the 40m sprint and the Illinois agility test). Thus an increase in the Bench press lifted is an improvement while an increase in the time to run a 40m sprint means the subject is running slower.

a), b), c) A majority of candidates were able to identify the correct athlete/round and calculate the number of seconds Athlete A improved their time. Very few candidates failed to achieve maximum marks for these questions.

d) Most candidates answered Athlete ‘C’, some ‘A’ and a few ‘B’. Most candidates were able to give a reasonable explanation. Global description required and the inclusion of data with units for full marks.

e) Most candidates answered ‘B’. Like d), most candidates were able to give a reasonable explanation. Global description and the inclusion of data with units required for full marks.

f) Most candidates answered ‘A’. Like d) and e), most candidates were able to give a reasonable explanation with a global description and relevant data with units required for full marks.

QUESTION 15

Most candidates attempted this question, many providing two inter-relationships. There were very few unanswered questions. Most candidates were also able to identify relationships between some good psychological skills and areas of exercise physiology which related to high levels of fitness.

Better answers were able to:

- Explain how the two selected areas within their link clearly related to each other
- In doing so, include some relevant theory to support their discussion
- Throughout their explanation refer to the information that was presented in the question/scenario to increase the application of the link.

Unfortunately, the weaker candidates linked two wrong core area/s, and there were some intra-relationships.

More popular responses included:
• High levels of motivation assisted in developing high LIP/Aerobic fitness
• A high level of intrinsic motivation contributed to an effective recovery regime
• The use of effective SMARTER Goals throughout the Periodised Training Year
• Motivation to attain chronic training adaptations
• Goal setting to achieve chronic training adaptations
• Self-efficacy antecedent of performance accomplishments attained throughout Harvey’s career contributed to his desire to continue to train hard/high intensity/specificity/improve LIP, etc.

SOLUTIONS

PART 1 – Exercise Physiology

Question 1

This question assesses Criterion 1.

A middle distance runner has a personal best time of 4:35.34 for the 1500m event.

(a) (i) What is the predominant energy system used by this runner in this event? (1 mark)

The aerobic system

(ii) Identify ONE by-product of the system identified in part (a). (1 mark)

CO₂, H₂O or heat

(iii) What is the predominant fuel source for this event? (1 mark)

Carbohydrates

(b) (i) The runner has a high VO₂ Max and therefore has well developed cardiovascular endurance. Explain these TWO terms and their relationship. (3 marks)

A high VO₂ Max reflects the runner’s ability to efficiently take in, transport and utilise oxygen for the production of energy (ATP). VO₂ Max is expressed in mL/kg/min.
Cardio Vascular Endurance (CVE): the ability of the heart and arteries to supply blood, and thus, oxygen to the working muscles.
Having an excellent CVE means that O₂ will be delivered to the working muscles and a high VO₂ Max will result in the body being able to fully utilise the O₂ to produce large amounts of ATP.

(ii) Choose ONE suitable training method this runner could utilise and explain how this method may improve their VO₂ Max. (2 marks)

Any form of continuous training, such as LSD/LT or Fartlek will have the runner elevate their heart rate and increase O₂ demand. As their body’s heart/lungs/muscles become more efficient at delivering and utilizing O₂, their VO₂ Max will improve

(c) Describe the production of ATP for this runner using the predominant energy system mentioned in part (a)(i).

(i) What is the name of the process (1 mark)

Aerobic glycolysis
(ii) How is ATP produced during this event? (3 marks)

In three stages: 1) anaerobic glycolysis - where Carbohydrates, stored as glycogen, are broken down into glucose and further into pyruvic acid. In the presence of O2, the pyruvic acid enters 2) the Krebs Cycle where some ATP is produced and CO2 is formed as a by-product. Hydrogen ions then move to the next stage, 3) the Electron Transport Chain/System, where a large amount of ATP is produced and H2O and heat are by-products.

**Question 2**

This question assesses **Criterion 1**.

Endurance training places a large amount of physiological stress on the human body, which may result in fatigue.

(a) What type and colour is the muscle fibre that an endurance athlete is attempting to develop when training? (1 mark)

**Type I or Slow Twitch**, which are classed as “red” in colour

(b) Outline **TWO** major causes of fatigue an endurance athlete may experience, explaining why fatigue occurs. (2 marks)

Any two of the following:
1) Depleted glycogen stores (“Hitting the wall”) - means more O2 is required to oxidise fats as the new major energy source, therefore there is a decrease in power output/intensity.
2) Accumulation of metabolic by-products such as lactic acid and H+ ions, (1/2 mark) which occurs at the start and at various stages of an endurance event when we are producing energy anaerobically. This can lead to a burning sensation and muscle contraction is inhibited which leads to fatigue.
3) An increase in body temperature and dehydration (1/2 mark); as water is lost through sweating, the body’s % of total water content decreases, negatively impacting on performance.

(c) Explain Glycogen Sparing and how an endurance athlete may take advantage of this chronic training adaptation. (2 marks)

An athlete’s ability, particularly early in a bout of exercise, to utilise fats to produce ATP, essentially sparing glycogen, which delays glycogen depletion; meaning they have more glycogen in reserve to work at higher intensities for longer periods of time, at a later stage in the event.

(d) (i) Complete the table below using chronic cardiovascular training effects **at rest** for an endurance athlete. (3 marks)

<table>
<thead>
<tr>
<th>Chronic training effect at rest</th>
<th>Explanation of why it physiologically occurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased Cardiac Hypertrophy</td>
<td>as heart responds to being used more, although Increase is more related to size of LV cavity</td>
</tr>
<tr>
<td>Unchanged or decreased Cardiac Output (Q)</td>
<td>as the increase in SV is countered by a decrease in HR</td>
</tr>
<tr>
<td>Decreased Heart Rate</td>
<td>Increased LV chamber leads to a more powerful contraction which means more blood is delivered to the body with each beat. As oxygen needs are being met, HR decreases</td>
</tr>
<tr>
<td>Increased Stroke Volume</td>
<td>Increased LV capacity leads to greater contractile force, hence</td>
</tr>
</tbody>
</table>
more blood pumped around the body with each beat. or
Increase in size of the left ventricle enables it to stretch more and
thus fill with more blood each beat

| Increased capillarisation to heart and skeletal muscle | Through endurance training there is an increased demand for oxygen requiring the body to build more capillaries where oxygen can be delivered to heart or muscles |
| Increased Total haemoglobin & blood volume | in response to the creation of more RBC's |
| Decreased Blood Pressure | People with blood pressure in the 'normal' ranges experience little change in BP at rest; however hypertensive people find that their BP’s reduce towards normal as they do more exercise. This is due to a reduction in total peripheral resistance within the artery, and improved condition and elasticity of the smooth muscle in the blood vessel walls |
| Increased a-vO2 difference | With more capillaries, mitochondria and myoglobin, the body is able to extract more oxygen from the arterial blood |

(ii) Outline the relationship between the training effects identified in the table above. (2 marks)

depends on the changes selected, however, the main relationship is :
Q=HR x SV so any change to Q (cardiac output) will also effect SV and HR.
Q tends to remain the same or slightly increase as any increase in SV is countered by a decrease in HR.

(e) Endurance training may result in athletes overtraining. What is overtraining and what are TWO physiological symptoms that an athlete may experience when they overtrain? (2 marks)

Overtraining is an imbalance between progressive overload and recovery.
Symptoms include chronic tiredness; pain in muscles and joints; elevated HR at rest; Insomnia; Headaches; Decreased immunity (increased number of colds, and sore throats), etc

Question 3

This question assesses Criterion 1.

The 1000 m Sprint Kayaking event is a sport held on calm water. The kayaker is seated, facing forward and uses a double-bladed paddle and pulls the blade through the water on alternate sides propelling the boat forward.

(a) Using the image above, identify TWO fitness components required by the kayaker and justify your selection. (3 marks)

Fitness Component 1:
Local Muscular Endurance (LME)

Justification:

Particularly upper body/arm muscles’ ability to repeatedly contract at a high intensity for the duration of the event.

Fitness Component 2:

Anaerobic Power; Muscular Power; Power

Justification:

High amounts of anaerobic power required using the ATP/PC system, at the start and during bursts of energy in the race (i.e., finish), to overcome the resistance of the water and propel the boat forward.

Note that many other components may have been accepted, depending on the justification given.

(b) Explain interval training. Outline TWO variables that the kayaker could change to vary an interval training session.

Interval training is a form of training in which work intervals are followed by rest intervals. It can improve speed/power/agility/aerobic or anaerobic capacity.

Could change work:rest ratio (W:R) so as to develop specific energy system
Could change number of sets or reps, to develop/enhance different energy system

(c) What is ONE training principle that should govern the kayaker’s training program and justify your selection?

Training Principle:

Specificity

Justification:

To be successful, the kayaker would need to ensure their training program worked on the specific energy systems, components of fitness, muscle groups and skills required.

Note: Other training principles may be accepted, depending on the justification given.

(d) The kayaker may have to compete multiple times a day. Name ONE physiological recovery strategy that could be used throughout the competition and describe this strategy.

Strategy:

Cool down/active recovery (1/2 mark)

Description:

At the completion of each race, LA levels will be elevated. The speed of its removal is increased by engaging in a light activity, usually the same one, but at a reduced intensity, which will bring breathing
rates down to resting levels. This should be followed by static stretching.

(e) During recovery, the kayaker’s heart rate remains elevated. Explain with reference to excess post-exercise oxygen consumption (EPOC), what is occurring physiologically during this process. (3 marks)

During EPOC, the HR remains elevated above normal resting levels for varying amounts of time, in order to provide the body with the oxygen it needs to complete the recovery processes. In the alactacid, or rapid phase, the haemoglobin and myoglobin stores are replenished, as are the phosphagen stores (stored ATP and PC). In the lactacid, or slow phase, the LA and H+ ions are removed and the glycogen stores are replenished.

Question 4

This question assesses Criterion 4.

All answers to this question must make reference to the information that follows.

Two Cyclists, with the same body weight, participated in a stationary cycle test to the point of exhaustion, starting at an intensity that produced 2 millimoles per litre (mmol/L) of blood lactate. One Cyclist was aerobically trained and the other cyclist was untrained.

(a) What was each cyclist’s blood lactate concentration and maximum power output at point of exhaustion: (2 marks)

Cyclist A: 9.5 mmol/L @ 200W

Cyclist B: 9.8 mmol/L @ 300W

(b) What was each cyclist’s blood lactate concentration and power output when they reached their LIP (point X)? (2 marks)

Cyclist A: 4 mmol/L @ 160W

Cyclist B: 4 mmol/L @ 260W
(c) Explain the relationship between blood lactate production and power output for Cyclist A and Cyclist B. (3 marks)

Cyclist A produces similar lactate levels to Cyclist B, but at much lower power outputs ie 
\[ A = 2 - 9.5 \text{ mmol/L but at 120-200W} \]
Cyclist B is able to work at much higher levels than A whilst producing lower levels of lactate ie 
\[ B = 2 - 10 \text{ mmol/L at 210-300W} \]
Both cyclists show that as intensity (power output) increases, lactate in the blood increases. At the highest workload (200W for A/300W for B), B is able to tolerate higher levels of lactate than A.

(d) What would be the most likely effect on blood lactate if Cyclist A tried to maintain a power output of 170 Watts (W) for an extended time? (2 marks)

At 170W, A’s blood lactate was at 5.6 mmol/L, which is 1.6 mmol/L above their LIP. Therefore, they would have been able to continue, but taking longer to reach their point of exhaustion (9.5 mmol/L) as lactate would rise more slowly than it would have if the power output continued to rise.

(e) Explain which of the two cyclists (A or B) was untrained by making reference to the graphs. (3 marks)

Cyclist A was untrained. This is evident as he/she reached a much lower maximal power output, 200W vs 300W. It was also evident in that he/she reached their LIP at a much lower intensity than Cyclist B, 160W vs 260W. Cyclist A’s starting power output (120W), where their blood lactate (mmol/L) was 2, is significantly lower than Cyclist B, 210W.

Question 5
This question assesses Criterion 5.
Kim Brennan was an elite level 400 m hurdler before injury ended her promising athletics career. In 2005, Kim started rowing after being identified by the Victorian Institute of Sport Talent Transfer program. At the 2016 Rio de Janeiro Olympic Games, Kim won gold in the women’s single skull rowing event. Both of the sports Kim has competed in require a high degree of fitness and precise technical execution of skills.

Using TWO interrelationships, discuss how Kim’s level of fitness (Exercise Physiology) has positively enabled her to execute skills (Skill Acquisition) successfully in her sporting career. (12 marks)

The two core units for this question were Exercise Physiology and Skill Acquisition.

Links must be made in the specific direction; from Exercise Physiology to Skill Acquisition.

Links must be made from a positive perspective - that is - what did Kim Brennan (KB) do from a physiological perspective that enabled her to successfully perform her skills?

Two links need to be made. Each link is assessed out of 6 marks, according to an agreed Guide, as set out in the Comments section above.

Examples of links which could have been used include:

- By delaying the effects of fatigue, KB was able to ensure she could receive the appropriate input.
- By employing a power based training program, KB was able to execute her skills in both events.
with optimal timing and minimal movement time.
- By developing her CVE and LIP, KB was able to ensure she could receive the most relevant and appropriate intrinsic FB to enable the correct execution of her skills.

“C” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received a “C” rating:

**Improved power -> improved movement time/response time**

Power is a combination of strength and speed. It is an explosive action that tries to apply as much strength as possible in the shortest amount of time.

Movement time is measured from the moment of an initial reaction to a stimulus until that action is completed. When combined with reaction time, it is referred to as Response time.

KB did lots of power based training throughout her career, including such things as plyometric box jumps, that enabled her to make faster starts out of the blocks in both athletics and rowing, which decreased her movement time and her overall response time. This training helped her achieve success in both sports.

“B” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received a “B” rating:

**Improved power -> improved movement time/response time**

Power is a combination of strength and speed. It is an explosive action that relies on the white/FT muscle fibres and tries to create as much force as possible in the shortest amount of time.

For KB, movement time in hurdling is measured from the moment she pushes back against the blocks, until she has crossed the line at the end of the race. When combined with reaction time, which is how long it takes her to detect and react to the starter’s gun, it is referred to as Response time.

KB did lots of power based training throughout her career, including such things as plyometric box jumps, where she eccentrically contracted her leg muscles before rapidly contracting them concentrically. This training enabled her to make faster starts out of the blocks in both athletics and rowing, which decreased her movement time and her overall response time, helping her achieve success in both sports.

“A” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received an “A” rating:

**NOTE:** This answer would be representative of the HIGHEST standard that could be expected, and is included to be more aspirational than prescriptive in nature.
Power based training enabled KB to improve her movement and response times.

Power based training focusses on developing the explosive, white/FT muscle fibres of the anaerobic energy systems, especially those of the phosphagen system. It can be developed through either resistance training which emphasises speed of movement working on around 70-80%1RM; short interval training with W:R of 1:5 over durations of about 5-8 seconds; or with plyometric training, such as box jumps, where the muscles are eccentrically contracted prior to being explosively contracted concentrically.

KB used training such as this in both her sports, as the quicker she completes any action, the faster her movement time will be. eg Movement time in hurdling is measured from the moment she pushes back against the blocks, until she has crossed the line at the end of the race. By improving her movement time, KB also decreases her overall response time; which is a combination of both reaction and movement times; increasing the likelihood of her success.

The sort of movements this power training improved included KB’s ability to ensure she got out of the "blocks" as quickly as possible in races; that she could explode over hurdles and ensure she successfully cleared each one; put on surges during her rowing races, and; so she had a burst of speed to finish of all her races. The cumulative reduction in her movement time throughout all of these actions enabled KB to have a successful career.

Part 2 - Skill Acquisition

Question 6

(a) Choose ONE of the following motor skills and outline the IP model that is involved in each of the components below. (2 marks)

Depending on the skill chosen, see table below. Examples must relate to the skill chosen not generalisations.

<table>
<thead>
<tr>
<th>Sensory Input (info from sensory receptors)</th>
<th>Catching a ball</th>
<th>Throwing a ball</th>
<th>Kicking a ball</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sight sound received by eyes / ears eg. Seeing the ball travel through space after hearing it hit with a bat</td>
<td>Look at where you are going to throw (target). Feel / touch the ball</td>
<td>Look at where you are going to kick the ball (target). Feel / touch the ball in your hands in correct grip</td>
<td></td>
</tr>
<tr>
<td>Processing (stimulus identification, response selection, response programming)</td>
<td>Stimulus Identification: after stimulus received, meaning is attributed to it from memory ie ball moving. Response selection: identified stimulus aligned to appropriate course of action. Response programming: specific motor program from LTM is co-ordinated</td>
<td>Identify that ball needs to be thrown to target. Identify type of throw that will be required. Specific response from LTM selected.</td>
<td>Identify that ball needs to be kicked to the target. Identify type of kick and degree of force required to get it there. Response selected.</td>
</tr>
</tbody>
</table>
and signal sent to muscles

<table>
<thead>
<tr>
<th>Output (the movement)</th>
<th>Movement of muscle or programmed action is initiated via activation of the motor neurons in muscle fibres.</th>
<th>Selected response sent to muscles via nerves and the chosen throw is now initiated</th>
<th>Selected response sent to muscles via nerves and the chosen kick is now initiated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feedback (information received during and/or after movement)</td>
<td>Information is received about success or failure of the response.</td>
<td>Info received about success or failure of throw</td>
<td>Info received about success or failure of kick</td>
</tr>
</tbody>
</table>

(b) Outline TWO factors that could affect an athlete learning a new skill (2 marks)

- Selective Attention: particularly with novice athletes. Overloading of input delays decision making and appropriate response.
- Signal Detection: Intensity of stimulus or effectiveness of sense organs can impact effectiveness of learning a new skill.
- Age & Maturity: an effect ability to acquire a skill. Children have lower capacity to process info than adults
- Gender: Differences between males and females, particularly physiology where men tend to perform better in power and strength activities.
- Hereditary: Genetic inheritance plays a major role in our physiological and psychological make up. Characteristics such as body type and proportion of FT / ST muscle fibres can impact the sport we do well in.
- Motivation: Impacts how persistent you are and how much effort you are willing to put in to improve.
- Quality of instruction or training: Skill learning is more rapid if the learner receives professional coaching or teaching.
- Ability to process information: Capacity of the brain to take in, understand and process new information
- Physical characteristics: Body type, etc. (see Hereditary)
- Personality: May determine your level of persistence with learning a new task.
- Socio-economic factors: $ can impact the opportunity you have to learn a particular skill and receive expert tuition
- Geographical location: where you live will have an impact on the skills you have access to learning. Eg can't learn to snow ski if you live in Alice Springs.
- Previous experience: Prior experience in a similar sport / activity can speed up the learning process eg. skills in tennis can partially translate to squash.
- Opportunity: Ability to access learning experiences.

(c) Choose ONE motor skill and list its subroutines in correct order. (2 marks)

Eg. Golf swing: Preparation, Backswing, Downswing, Impact, Follow Through.
Eg. Tennis Serve: Grip, Stance, Backswing, Ball Toss, Forward Swing, point of contact, Angle racquet head, Follow Through.

(d) (i) What stage of skill learning is a beginner in when learning a new motor skill? Identify THREE characteristics of this stage. (2 marks)

Cognitive Stage
Characteristics: any **three** of the following:
- make many errors; getting an idea of the skill; devote attention to step by step procedures;
- have a high attentional demand; rarely repeat the skill the same each trial; can perform the skill slowly; watch for feedback from each previous skill attempt; poor timing; unnecessary movements; rapid progression in skill and improvements in performance; self-talk about what to do next; may become frustrated and lose motivation

(d) (ii) Identify **TWO** changes that will occur when a beginner has progressed to the next stage of learning. (2 marks)

Changes: any **two** of the following:
- quicker and smoother movements; more efficiency of movement; improvements become incremental (learning curve is not as steep); Less self-talk; Consistency between successive performances of the skill; Performer can evaluate and critique their skill; Develop anticipation and timing; Refine accuracy and consistency of skill; Reduce degree of error; Recognise errors themselves; Know how to do a skill, not just what to do; Require feedback on technical aspects to improve

(e) When learning a new motor skill which type of practice would be best suited to developing the skill and justify your selection. (2 marks)

<table>
<thead>
<tr>
<th>Type of practice</th>
<th>Justification of selection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mass</td>
<td>Practicing a skill consistently and continuously without breaks until learnt. Depends on the skill – if juggling for example, a person could theoretically undertake a mass session.</td>
</tr>
<tr>
<td>Distributed</td>
<td><strong>Best for beginner.</strong> Short, frequent sessions. Easier to concentrate and not become bored. May be helpful to intersperse new skills with other activities or games to maintain motivation and concentration in beginners.</td>
</tr>
<tr>
<td>Whole</td>
<td>Learning a skill in its entirety. Depending on the skill could relate to learning a new skill.</td>
</tr>
<tr>
<td>Part</td>
<td>Learning of skills broken down into parts or subroutines</td>
</tr>
<tr>
<td>Blocked</td>
<td>Learning one component of a multi task skill in order to refine and improve that specific component. This could be the case for someone learning a new skill – eg. learning the ball toss before the serve.</td>
</tr>
<tr>
<td>Random</td>
<td>discounted</td>
</tr>
<tr>
<td>Varied</td>
<td>discounted</td>
</tr>
<tr>
<td>Constant</td>
<td>A routine where one skill is repeated exactly multiple times. This makes sense when learning a new skill as you want the skill to become more consistent.</td>
</tr>
<tr>
<td>Drill</td>
<td>Learning through repetition is <strong>suited to a beginner</strong> who must repeat a large number of times.</td>
</tr>
</tbody>
</table>

**Question 7**

(a) List and describe the three different memory storage sites and for each include:
- Length of time and amount of information that can be retained
- Methods of increasing the efficiency of the site
- A sporting example of your choice (6 marks)

<table>
<thead>
<tr>
<th>correct term/description</th>
<th>1.Short Term Sensory Storage</th>
<th>2.Short Term Memory</th>
<th>3.Long Term Memory</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length of time &amp; amount of info that can be retained</td>
<td>1 second vast amounts of info</td>
<td>Up to 60 seconds 5-9 items = accepted range</td>
<td>Permanent Limitless</td>
</tr>
<tr>
<td>Methods of increasing efficiency</td>
<td>Being able to Selectively Attend will increase the storage site’s capacity to ’sift’ out irrelevant info.</td>
<td>Chunking or coding Add meaning, relevance Repetition, rehearsal, practice Limit overloading &amp; distractions</td>
<td>Encoding / Practice Add Meaning Rehearsal and repeat learning</td>
</tr>
<tr>
<td>Sporting example</td>
<td>Player surveying the field for opponents and teammates. Ball travels to be caught and athlete needs only to concentrate on its path and not any other part of the environment.</td>
<td>Watch a walk through of a drill and recall it in immediate practice. Listen to coach in huddle and put instructions into play.</td>
<td>Ability to recall how an opponent may play according to past experience / watching videos of their game. Correct motor program is selected for catching a ball above head on a windy day. Remembering a set play</td>
</tr>
</tbody>
</table>

(b) How does selective attention increase an athlete’s short term memory (STM) capacity? (1 mark)

Selective attention minimizes the amount of information that needs to be processed in the STM and therefore leaves greater capacity for relevant cues.

(c) Explain Hicks’ Law and the implications on an athlete’s capacity to remember information. (2 marks)

Hicks’ Law states that there is a linear relationship between the increasing number of stimuli/response alternatives presented and an increase in reaction time. If an athlete does not minimize stimuli using selective attention then the time taken to process more cues / stimuli will also increase. The more information that needs to be processed, the more likely to overload the STM and STSS thus impacting memory.

(d) Explain how viewing video footage of a team/opponent may help an athlete to improve their spatial anticipation and take advantage of the Psychological Refractory Period (PRP) (3 marks)

By observing trends in the footage, an athlete may improve spatial anticipation, ie predicting what an opposition will do in a particular situation. It may also give an insight into when you may be able to use (or when you opponent might use) a fake or baulk to try and throw your opponent and buy time, effectively taking advantage of the psychological refractory period. Watching the footage may help the athlete to recognise “fake” cues and attend only to genuine cues, effectively reducing the impact of the PRP.

Question 8

Select ONE skill you are familiar with
(a) (i) Give TWO examples of how having biomechanical knowledge could improve performance in the skill you have selected. (2 marks)

Generalised statements, such as:

- Biomechanics can assist you to develop efficient technique in a motor skill, optimise performance and reduce injury
- Biomechanics can enhance performance by improvements to the designs and materials of equipment

OR – specific sporting examples of the use of biomechanical knowledge, such as:

- A knowledge of the effects of air resistance can cause a cyclist to improve their streamlining and lead to increased speeds.
- Knowledge about imparting spin on a table tennis ball can greatly improve the ability to serve the ball, improving performance.
- Changing angle of release of a javelin can change the parabola of flight and thus improve distance thrown, etc.

(a) (ii) List the steps you would take to analyse the skill mentioned above to improve it biomechanically. (2 marks)

- Determine objective of the skill
- Use observation – Naked eye and video / computer analysis techniques
- Identify movement patterns
- Divide the skills into skill phases or key elements
- Detect errors
- Identify starter mechanisms

(b) Outline how senses can be utilised to perform the skill mentioned in part (a)(i) by providing THREE examples. (3 marks)

Answers dependent upon the candidates’ prior chosen skill. Any three examples such as:

- Vision - allows the performer to follow moving projectiles, judge distance and direction of an object and detect colour and brightness. Eg. Golfer estimating distance to the green in order to make correct club selection

- Equilibrium (balance) – internal sense telling you if your body is in balance and under control. Very important in motor skills especially in those requiring rapid changes in movement or specific balance or control. Eg. diver or gymnast holding a handstand.

- Proprioception – (kinesthesia and touch) – awareness of muscular movements and effort as well as positions and angles of joints and tendons. Allows you to judge how a movement ‘feels’. Eg. Professional cricketer knows how a ball will travel as soon as he ‘feels’ the shot off his bat.

- Hearing – importance in sport at times for example hearing the starter’s gun, coach feedback, team mate message, hearing an opponent close behind you, umpires whistle, etc.

(c) Explain what a starter mechanism is, using any example. (2 marks)
A movement used in a skill which appears to have little relevance to the efficient performance of the skill. These have little bearing on the skill, some initiate an early rhythm before entering an important phase of the skill.

Eg. Tennis player who bounces the ball a set number of times before a serve.

(d) Apply Newton’s Second Law of Motion to a sporting example of your choice. (1 mark)

Eg. A golf ball will accelerate more quickly when the ball is hit with the greater force of a driver from the tee compared to the small force required for a putt.

(e) Explain how angle of release influences projectile motion, using any example. (2 marks)

Equal amounts of force are applied in a vertical & horizontal direction when the angle is 45°, which is considered optimal for gaining maximum distance in most situations, eg throwing a cricket ball or baseball.

Angles greater than 45° will result in shorter distances, greater heights and longer flight times. eg the up and under kick in rugby.

Angles of less than 45° or will result in shorter distances, lower heights and shorter flight times (faster). eg This may be used by a close in cricketer throwing to the keeper to get the ball there as fast as possible for a run out.

Question 9

(a) Which athlete performed best with: (2 marks)

KP – Athlete 3, scored 6/10
KR – Athlete 2, scored 3/10

(b) Which athlete overall had the least amount of successful shots on all four trials? (2 marks)

Athlete 4, with a total score over 4 trials of 14/40
OR,
Trial 1 Athletes 4 & 1 with 4 shots in
Trial 2 Athlete 5 with 1 shot in
Trial 3 Athlete 4 with 4 shots in

(c) Which athlete(s) performed better when they were given more than one type of feedback? (3 marks)

Athlete 1 – Scored 6/10 with KP & KR and only 4/10 (KP) and 2/10 (KR)
Athlete 5 – Scored 8/10 with KP & KR and only 5/10 (KP) and 1/10 (KR)

(d) Which athlete(s) performed the same or better when given no feedback? (2 marks)

Athlete 2 performed better with 9/10 with no feedback
Athlete 4 performed the same with 4/10

(e) Compare all trials to determine which trial produced the best overall score. What does this suggest about the best type of feedback for basketballers based on these results? (3 marks)
Trial 3 produced the best overall score with 28, (or an average of 5.6)
This compares to Trial 1, which 24 (or an average of 4.8); Trial 2, which scored 10 (or an average of 2.0), and; Trial 4, which scored 23 (or an average of 4.6).
This suggests that best feedback for basketballers would be a combination of both KP and KR.

Question 10

Australian tennis player Nick Kyrgios had a major loss in the 2017 Australian Open in which he exited the competition a lot earlier than expected. It was reported as a ‘self-destructive choke’, as he was only two games away from winning the match. He instead began to engage in an unpleasant verbal battle with his own supporters in his courtside box. He began focusing on this interaction instead of the game itself.

Discuss TWO interrelationships that show how Nick’s state of mind (Sport Psychology) had a negative impact on his execution of skills (Skill Acquisition). (12 marks)

The two core units for this question were Sport Psychology and Skill Acquisition.

Links must be made in the specific direction; from Sport Psychology to Skill Acquisition.

Links must be made from a negative perspective - that is - what psychological aspects were impacting on Nick Kyrgios (NK) and how did they negatively impact on his ability to play tennis?

Two links need to be made. Each link is assessed out of 6 marks, according to an agreed Guide, as set out in the Comments section above.

Examples of links which could have been used include:

- NK’s inability to shift between attentional styles as needed meant he failed to selectively attend to the relevant cues
- NK’s failure to control his level of arousal meant he could not execute his skill with the correct timing
- NK’s lack of motivation meant he failed to gain the necessary feedback to correct his errors
- NK’s anxiety/choking negatively influenced his decision making and shot selection

“C” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received a “C” rating:

Inability to shift between attentional styles - failure to selectively attend the relevant cues
There are four attentional styles: Broad External; Narrow External; Broad Internal, and; Narrow Internal. Athletes need to “shift” between styles and be in the right one at the right time to get the right information and make the right decisions.

Selective attention is the ability to focus on the correct cues at the correct time and avoid focusing on “noise”.

NK was in Broad External, arguing with his supporters (“noise”) when he should have been in Narrow External, focussing on what his opponent was doing. Because of this he missed vital information which caused him to lose the match.

“B” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received a “B” rating:

**NK’s failure to shift into the correct attentional styles meant he failed to selectively attend to the relevant cues**

There are four attentional styles: Broad External – not that relevant in tennis; Narrow External – focussing on the ball or your opponent’s racquet or body position; Broad Internal - focussing on what your game plan will be, such as what shots to play at what times, and; Narrow Internal - focussing on the ‘feel’ of how much force to put into each shot. Athletes need to “shift” between styles and be in the right one at the right time to get the right information and make the right decisions.

Selective attention is the ability to focus on the correct cues at the correct time and avoid focussing on “noise”.

NK spent too much time in Broad External, selectively attending to the interactions with his supporters in his box (“noise”), and then in Broad Internal, focussing on negative thoughts and feelings, when he should have been in Narrow External, focussing on his opponent’s ball toss before serving, or his position on the court. As a result of being in the wrong attentional style, NK missed vital information which caused him to lose the match.

**“A” Standard**

The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received an “A” rating:

**NOTE**: This answer would be representative of the HIGHEST standard that could be expected, and is included to be more aspirational than prescriptive in nature.

**NK’s failure to shift into the correct attentional styles meant he failed to selectively attend to the relevant cues**

NK failed to be in Narrow External attentional style, where he should have been selectively attending to the relevant cues, such as the angle of his opponent’s racquet face. Instead, he was in Broad Internal, thinking of all the things he could argue with the supporters in his box about. As a result, he failed to pick up on the fact that his opponent was about to play a cross court shot, rather than a down the line shot, catching NK flat footed, and allowing his opponent to hit a winner.

On another occasion, NK was in Narrow Internal, but instead of focussing on the force he should have been applying to the ball to play a drop shot, he is focused on the tension he can feel in his muscles created by the tightening of his muscles as a result of the arguing with his supporters. This caused him to play a jerky shot that fell short of the net, losing him the point.

Finally, at the change of ends, when NK should have been in Broad Internal, working out the best strategy for him to close out the game, he was in Narrow External, arguing with the chair umpire over a call from the previous game. This caused NK to start the next game without a clear focus, allowing his opponent to dictate play.

All these examples indicate situations where NK was either in the wrong attentional style, or in the right style, but attending to “noise” rather than selectively attending to the relevant cues, which caused him to lose the match when he was in a winning position.

**Part 3 – Sport Psychology**

**Question 11**

This question assesses Criterion 3.
Successful athletic performance depends on many factors, including the level of an athlete’s arousal. Arousal is determined by psychological processes such as emotions and positive or negative thoughts.

(a) The Inverted ‘U’ Hypothesis is one theory on arousal, explain this theory using a sporting example. (2 marks)

Inverted U Hypothesis states that as arousal increases so too does performance until a point in which arousal and performance are optimal. If arousal continues to increase past this point then performance will decrease. Eg in Olympic lifting athletes need a high level of arousal to lift the weight. Over arousal will cause a loss of concentration and a decrease in performance.

(b) How can you apply the Inverted ‘U’ hypothesis to achieve optimal arousal for fine and gross motor skills? (2 marks)

Both a fine and gross skill require athletes to utilise optimal arousal for best performance of that skill. A fine skill requires high precision therefore a lower level of optimal arousal for maximum performance eg. Throwing a dart.
As compared to a gross skill which does not require as much precision and uses the whole body therefore a higher level of optimal arousal for maximum performance eg. Weightlifting.

(c) Outline ONE coping strategy for EACH time period below that an athlete may use to maintain their optimal arousal level. (2 marks)

Prior to competition: So an athlete can arrive at the venue ready to go with the correct level of arousal, they should have in place a coping strategy in case their parents do not wake them up in time. A coping strategy for this is to set one or two alarm clocks to ensure adequate time to get ready and arrive.
Equally valid for any other aspect relevant to prior; including gear; travel, food, ie any pre-competition strategy.

During competition: A coping strategy of a backup plan such as players being ready to play on any opponent or in any position if the primary game plan isn’t working. This way no opponent will be a surprise on competition day.
Equally valid for any other aspect relevant to competition; including game plan; Performance Reference Points checks, Task relevant factors, Mood/cue words, Coping with Pain strategies; if show the link to maintaining optimal arousal

(d) Outline TWO techniques (ONE athlete directed and ONE coach directed) that can be implemented to assist an under aroused athlete. (2 marks)

Athlete directed: Listen to motivational music, get a pep talk from the coach, associate with other aroused athletes, go for a vigorous warm up, etc.

Coach directed: Increase the importance of the competition to the athlete, give the athlete an important role, talk up the athlete and emphasise their responsibility, suggest they listen to motivational music,
suggest they go do a vigorous warm up, etc.

(e) Explain the Catastrophe theory with reference to the terms ‘arousal’ and ‘anxiety’ using a sporting example of your choice. (4 marks)

It states that as arousal increases so too will performance as long as cognitive anxiety remains relatively low. Thus, if arousal and cognitive anxiety continue to increase past the optimal zone then there may be a catastrophic decline in performance and once this happens it will be very hard to get back to the optimal range of arousal therefore performance is likely to keep decreasing unless the player is able to refocus and significantly decrease their anxiety level. Eg. a rugby player needs a high level of arousal for optimal performance, however if the rugby player becomes anxious due to selectors watching him play, he starts to fumble the ball and experiences a catastrophic decline in performance. He requests to be substituted off to regain control otherwise he will continue a downward cycle and have a very poor performance.

Question 12

This question assesses Criterion 3.

As an athlete performing to the best of your ability, challenging yourself every training session is tough. The results are often not seen until months or even years of training. Therefore, it is critical for athletes to use different motivational techniques.

"IF YOU DON'T SEE YOURSELF AS A WINNER, THEN YOU CANNOT PERFORM AS A WINNER."

Source: Google images

(a) The above image is an example of what athletes may use as a motivational technique. Identify TWO types of motivation this image is representative of and justify your selection. (4 marks)

Type of motivation: POSITIVE
Justification: The above image is reinforcing to the athlete that they need to positively believe in themselves and their ability. Therefore enhancing their self-confidence to achieve.

Type of motivation: INTRINSIC
Justification: If an athlete has the displayed on their wall or in a training diary for example and they continue to look back on it, it can be a used as reminder that they have to keep believing in themselves and training
hard for themselves and wanting to be a winner yourself. This can only happen if you have intrinsic motivation whereby you’re your sport and do it for yourself, not for extrinsic gain. (1 ½ marks)

(b) How might using this type of motivational technique affect an athlete’s self-confidence? (1 mark)

This will improve self-confidence as they will not only see themselves as a winner but feel like a winner too and therefore believe in their own ability to achieve.

(c) ‘If an athlete has good self-confidence in general, this may transfer across into their preparation and performance in a sporting event.’ Explain the concept that is referred to in the statement above and outline TWO antecedents that Bandura states would enhance the concept. (3 marks)

This statement refers to self-efficacy. Self-efficacy is a situational form of self-confidence/belief in one’s self and ability in their preparation and performance in a sporting event.

Bandura’s antecedents that enhance self-efficacy - include any 2 of the following:

- **Performance accomplishments**: If we have succeeded in a certain activity in the past, we are confident we can do it again.
- **Vicarious experiences (or modeling)**: This relates to when we see someone succeed and we think ‘If they can do that, I can too’.
- **Verbal persuasion**: When a coach or external source convinces us we can do something.
- **Physiological states (Arousal control)**: This relates to the way we feel physiologically as an indication of how confident we are, of example if we are aware of having butterflies in our stomach we most lose confidence.

(d) (i) A high level of self-confidence may contribute to an athlete being better able to control their attention. Choose ONE sporting situation and discuss the appropriate attentional control necessary for optimal performance. (2 marks)

In AFL a mid-field player needs to be able to perform mainly using a broad external focus. That is, they can pick up on a number of external cues/stimuli and can quickly analyse a complex situation and respond to it. They “see” everything that is happening.

(ii) Explain a sporting situation where optimal attentional control may change. (2 marks)

A midfield AFL player uses a broad external focus when scanning the field to get into a free position and away from the opposing team. The player leads for the ball and shifts his attention to solely focuses by looking at the ball using a narrow external attentional style.

**Question 13**

*This question assesses Criterion 3.*

It has been stated that ‘Athletic success is as much psychological as it is physical’. It is critical that an athlete is aware of a range of psychological factors that could impact their performance.
(a) Explain how self-talk, mental rehearsal and concentration could either positively or negatively impact an athlete’s performance. Provide a sporting example with EACH explanation.

(i) Self-talk (2 marks)

Positive self-talk makes use of an athlete’s powerful inner voice to reinforce their self-esteem or important aspects of their performance. With appropriate repetition, self-talk can positively alter an athlete’s self-belief or if an athlete continues to doubt themselves this will negatively impact performance. Eg. If a 100m sprinter convinces themself they can run under 12.5 seconds then they probably will get there!

(ii) Mental rehearsal (2 marks)

This is the process of imagining yourself performing a specific movement or skill. If you positively see yourself performing a skill and you engage in mental rehearsal frequently this can transfer across into how an athlete performs. However, if a soccer player mentally rehearses themselves missing a penalty shot this is likely to occur and therefore negatively impacts performance.

(iii) Concentration (2 marks)

Concentration is the ability to completely focus your attention on something for a period of time. When athletes concentrate well they can take in all the information they need to make good decisions like responding to their opponent or adapting to their environment, therefore positively impacting performance. However, if athletes are not concentrating they will miss important cues/stimuli, which will result negatively on performance. Eg. A cricketer who is about to take the catch needs to maintain concentration on the ball and not on the batsmen to make it successful.

(b) Outline THREE benefits of goal setting for an athlete. (3 marks)

Answers could include any three of the following:

**Goals enhance focus & concentration**
- Goal setting improves performance by focusing attention on important elements of the skill(s) being performed.

**Goals boost self-confidence**
- Individuals need to know that they are competent and that they have choices. Goal setting is an excellent way to improve self-confidence as it is a way of seeing evidence of choosing right.

**Goals help create a positive mental attitude**
- Goal setting improves performance by encouraging perseverance and contributing towards a positive psychological state.

**Goals increase intrinsic motivation to excel**
- The goal that is valued and considered worthwhile will provide the spur needed to overcome tiredness, boredom, disappointment and poor performance and to maintain an effort.

**Goals enhance playing skill, techniques and strategies**
- The goal is the end point and the instigation for the processes needed to reach it. A goal will rarely be achieved without the requisite strategies. These strategies can relate to formulating training programs, making lifestyle choices/changes and developing competition strategies, amongst others.
Goals improve overall performance
The underlying reason for goal setting. If each of the above is in place it will be very difficult for performance not to improve. etc, etc, etc

(c) When an athlete sets goals it is advisable that they adhere to a number of guidelines. Choose THREE guidelines an athlete could use and explain why each of these would be of benefit to an athlete of your choice. (3 marks)

Any three of the following

- **Specific**
  - Goals need to be specific and as clear as possible to focus attention
  - For example, The goal “I want to improve my percentage from the free throw line” provides focus and a quantifiable measure and, importantly, is process based. It provides the player with a structured goal to which strategies can be applied.

- **Measurable**
  - Goals which can be quantified are more easily set and reviewed than those which are subjective. If a tennis player sets the goal “to land the serve within the service court on 7 out of 10 attempts during training (twice per week)”, they will see if/when achieved and will feel better when it is, or work harder if not.

- **Agreed or Accepted**
  - Most goals we set rely on input from or agreement with others. The coach, team mates and parents are all part of the goal setting equation. We usually need the support and expertise of others in order to achieve our goals. eg A cricket coach will spend more time with you in the nets if they, like you, believe you are good enough to make the state team.

- **Realistic**
  - Goals should extend the athlete but be achievable within their ability, as achieving a challenging goal provides a sense of achievement and fuels motivation to strive for further goals. For example, “70% success rate from the FT line in BB is realistic for this player”

- **Time framed or phased**
  - Goals should include a specific date for completion. Goals should be set for each training session, each training phase, each competition, and each year and often for a career. eg “I cannot leave training until I make at least 6 successful attempts from 50m out directly in front” (AFL). Sticking to this commitment will see long term benefits.

- **Evaluated**
  - The athlete needs to ensure they periodically assess their progress towards their goal/s. This enables them to make changes to the program, or the goal, depending on the outcome of the evaluation. eg “I want to ensure at least 75% of my shots in soccer are ‘on target’. Reviewing at ½ season mark shows this is still a realistic option which reinforces the efforts made.

- **Recorded**
  - Goals should be written down for example, in a training diary. Goals which are written down are goals which are not forgotten, can be reassessed and are a constant motivation. eg – the first thing I see when I wake up each morning is “I will make the state team this year”, which reminds me of why I am doing what I am, increasing the likelihood of me doing the required work to make it a reality.

**Question 14**

*This question assesses Criterion 4.*

**All answers to this question must make reference to the information that follows.**

Three 17 year old female athletes (A, B and C) took part in three rounds of fitness tests to determine their motivation levels to perform. All three athletes had similar beginning fitness levels,
height and weight. They completed the fitness tests under three different sets of conditions.

**Round (Rd) 1**  Athletes completed all fitness tests in complete isolation from the other athletes with no external motivating factors (internal motivation only)

**Round (Rd) 2**  All athletes competed against each other

**Round (Rd) 3**  All athletes competed against each other, with friends/ family watching and an extrinsic reward of $5 000 on offer for the best overall performing athlete.

**Table 1 - Results for Three Athletes on a Series of Fitness Tests**

<table>
<thead>
<tr>
<th>Test</th>
<th>Athlete A</th>
<th>Athlete B</th>
<th>Athlete C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rd 1</td>
<td>Rd 2</td>
<td>Rd 3</td>
</tr>
<tr>
<td>Beep Test (level and shuttle)</td>
<td>5.2</td>
<td>5.0</td>
<td>4.8</td>
</tr>
<tr>
<td>Vertical Jump (cm)</td>
<td>21.6</td>
<td>19.1</td>
<td>16.5</td>
</tr>
<tr>
<td>1RM Bench Press (kg)</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Sit and Reach (cm)</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
<tr>
<td>40m Sprint (secs)</td>
<td>8.2</td>
<td>8.0</td>
<td>7.9</td>
</tr>
<tr>
<td>Illinois Agility Test (secs)</td>
<td>24.9</td>
<td>25.8</td>
<td>26.7</td>
</tr>
</tbody>
</table>

**Note:** RM = Repetition Maximum - maximum amount of force that can be generated in one maximal contraction.

Based **ONLY** on the above information:

(a) Which athlete achieved the highest result on the beep test and in which round did it occur?  

**Athlete B in Round 3**

(b) Which athlete achieved the lowest result on the Vertical Jump Test and in which round did it occur?  

**Athlete A in Round 3**

(c) How many seconds did Athlete A improve their 40m Sprint time by, from Round 1 to Round 3?  

(1 mark)

(In Round 1 Athlete A recorded 8.2 seconds, in round 2 they recorded 8 seconds and in round 3 they recorded 7.9 seconds) therefore, they improved by 0.3 seconds.

(d) Which athlete is likely to be motivated intrinsically? Provide TWO possible reasons why.  

(3 marks)

**Athlete C.** They performed the same or better on 5 out of 6 fitness tests on round 1 when Athletes completed all fitness tests in complete isolation from the other athletes with no external motivating factors (internal motivation only).

Eg In round 1 they ran to level 11 in the beep test but only level 10.4 in round 3 OR

In round 1 they lifted 10kg on the bench press and only 7.5kg in round 3.
(e) Which athlete performs best when extrinsic motivating factors are present? Provide TWO possible reasons why. (3 marks)

Athlete B, as their performance increased most from rounds 1-3, when the motivating factors of competing against each other; with friends/ family watching, and a reward of $5 000 was offered for the best overall performing athlete.

Eg In round 3 they ran to level 14.5 on the beep test but only 6.1 in round 1 OR In round 3 they lifted 15.5kg but in round 1 only lifted 7.5kg.

(f) Which athlete appears to present as motivated towards the series of fitness tests? Provide TWO possible reasons why. (3 marks)

- Athlete A
- Compared to all other athletes Athlete A’s results were lower compared to Athlete B and C in most of the tests (question states athlete are the similar fitness level) and they showed no improvement in most of the tests
- Data to support would be that their results were lower in every test except for the Bench press where they lifted 10kg or
- The only test they improved on from rounds 1 to round 3 was the 40m sprint from 8.2 sec to 8.0 to 7.9 secs or
- They scored the lowest on all 3 rounds of the beep test. In round one they achieved level 5.2 and this actually even decreased further to level 4.8 in round 3 or
- They also got slower in the Illinois agility run from round 1 where they ran 24.9 secs to round 3 where they ran 26.7secs. These times were the slowest of all 3 athletes.

Question 15

This question assesses Criterion 5.

North Melbourne Australian Football League (AFL) player Brent Harvey announced his retirement from AFL football earlier this year after a record 432 matches with the club, across 21 years. He kicked 518 goals, won the North Melbourne Best and Fairest award 5 times and won 1 Grand Final. He was also chosen as a member of North Melbourne’s Team of the Century (the best players at the club over the last 100 years), which indicates he is a very talented AFL footballer.

Discuss TWO interrelationships between how Brent was able to use psychological skills (Sport Psychology) to play elite level football for so long and maintain his high level of fitness (Exercise Physiology). (12 marks)

The two core units for this question were Exercise Physiology and Sport Psychology.

Links can be made in either direction; from Exercise Physiology to Sport Psychology, or from Sport Psychology to Exercise Physiology.

Links must be made from a positive perspective - that is - what psychological skills did BH use to maintain his high fitness levels, or; how did his high fitness levels enable BH to adopt psychological strategies which prolonged his career at the elite level?

Two links need to be made. Each link is assessed out of 6 marks, according to an agreed Guide, as set out in the Comments section above.
Examples of links which could have been used include:

- BH was highly motivated to train and improve his LIP
- BH used process goals as part of a very well structured training program
- BH had developed excellent recovery techniques which increased his self-confidence to keep playing
- BH had well developed chronic training effects that increased his self-confidence to endure a game of AFL
- BH’s enhanced lactic acid energy system meant he could maintain concentration for longer during an AFL game.
- BH used would use mental rehearsal during the transition phase of his training year to give himself a physical break but still engage in some form of training.

“C” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received a “C” rating:

**Motivation -> Improving LIP**

Motivation is the drive or reason behind why people do the things they do. It can come from inside (intrinsic) or from outside (extrinsic) sources. Your Lactate Inflection Point (LIP) is the highest level at which you can attain a steady state of exercise, using your aerobic system.

Brent Harvey (BH) is both intrinsically motivated by his love for the sport, and extrinsically motivated by the thrill of holding an AFL record, that he trains frequently and intensely enough to ensure he has a high LIP so he can run out games and recover quicker between repeated high intensity efforts in matches. This is why he has been able to play AFL for as long as he has.

“B” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received a “B” rating:

**BH was highly motivated to train and improve his LIP**

Motivation is the drive or reason behind why people do the things they do. It can come from internal (intrinsic) or from external (extrinsic) sources. External sources can be either tangible, such as $ or trophies; or intangible, such as fame or adoration from fans. Most motivation is a combination of both. Motivation can also be a positive or negative force.

Your Lactate Inflection Point (LIP) is the highest level at which you can attain a steady state of exercise, using your aerobic system. Once intensity of exercise increases beyond this point, you begin to work anaerobically and will begin to fatigue.

Brent Harvey (BH) is both intrinsically motivated by his love for the sport and the pride he feels each time he runs out in his team’s colours, and extrinsically motivated by the money he has earned over his career to provide for his family, and the recognition that comes from holding an AFL record. This level of motivation is what has driven BH, over many years to undertake the boring and repetitive LSD runs in excess of 10 km’s, 3 or 4 times a week, so that he maintained his LIP at a high enough level to run out games and recover quicker between repeated high intensity efforts in matches.
This motivation to do whatever is required has ensured BH has had such a long and enduring AFL career.

“A” Standard
The following is an example of a link that could have been made. If two links of a similar standard were written, the candidate would have received an “A” rating:

NOTE: This answer would be representative of the HIGHEST standard that could be expected, and is included to be more aspirational than prescriptive in nature.

BH was highly motivated to train and improve his LIP

BH is intrinsically motivated by his love for AFL and the pride he takes in his own preparation and performance both at trainings and on game days. However, he is also extrinsically motivated by the tangible $ that AFL has enabled him to earn in order to provide a better quality of life for his family, and the intangible recognition he receives as the record holder of games played at AFL level. Throughout his career, BH has been driven by both of these factors, as well as others, with one usually being more important than the other at any given point in time.

Your Lactate Inflection Point (LIP) is the highest level at which you can attain a steady state of exercise, using your aerobic system. Once intensity of exercise increases beyond this point, you begin to work anaerobically and will begin to fatigue. It can be developed by either continuous training, such as LSD or LT training, or through HIIT.

Training, such as LSD can be boring and repetitive (eg running in excess of 10 km’s, 3 or 4 times a week), while HIIT (eg 3 sets of 10 x 400m sprints at a W:R of 1:3) can be fatiguing and cause pain from soreness and burning in the muscles. Despite this, BH has always been driven by his level of both intrinsic and/or extrinsic motivation to do whatever is required in order to develop and maintain a LIP that is as high, or higher than that of his peers. This has meant that he can work at very high intensities for as long as possible while still working aerobically, and that when he does work anaerobically, he is able to recover quicker between repeated efforts to chase down the ball or an opponent. This level of commitment has ensured that BH has achieved such a successful and enduring AFL career.