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**TOTAL MARKS**

NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY/JUNE 2021

# SPORT AND EXERCISE SCIENCE

**EXAMINATION NUMBER**

Time: 3 hours 200 marks

## PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 32 pages. Please check that your question paper is complete.
2. **All the questions must be answered on the question paper.**
3. Read the questions carefully.
4. Use the total marks awarded for each question as an indication of the detail required.
5. It is in your own interest to write legibly and to present your work neatly.
6. TWO blank pages (pages 31 to 32) are included at the end of the question paper. If you run out of space for a question, use these pages. Clearly indicate the question number of your answer should you use this extra space.

**FOR MARKER'S USE ONLY**

| **Question** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | **Total** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Marks** | 18 | 16 | 10 | 34 | 9 | 28 | 9 | 16 | 27 | 13 | 20 | **200** |
| **Obtained** | | | | | | | | | | | | |

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## QUESTION 1

1.1 Match a description in column B to the term in column A. Write only the letter of your chosen description in the table below.

| COLUMN A | | COLUMN B | |
|---|---|---|---|
| 1.1.1 | Drag | A | The storage form of carbohydrates. |
| 1.1.2 | Tapering | B | An example of a dynamic balance. |
| 1.1.3 | Laminar flow | C | Typically lasts 4–16 weeks. |
| 1.1.4 | Eustress | D | Smooth flow of air around an object. |
| 1.1.5 | Glycogen | E | A decreased capacity for work |
| 1.1.6 | Meso-cycle | F | A line extending from the centre of mass vertically down to the ground. |
| 1.1.7 | Overtraining | G | A force causing resistance in water or in the air. |
| 1.1.8 | Line of gravity | H | Positive stress. |
| 1.1.9 | Ice skating | I | Spinning motion causes air pressure on one side of ball to be less than on the other side. |
| 1.1.10 | Magnus effect | J | A progressive reduction of training load in an attempt to reduce the demands of training and to optimise performance. |

**Answers:**

| | |
|---|---|
| 1.1.1 | |
| 1.1.2 | |
| 1.1.3 | |
| 1.1.4 | |
| 1.1.5 | |
| 1.1.6 | |
| 1.1.7 | |
| 1.1.8 | |
| 1.1.9 | |
| 1.1.10 | |

(10)

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1.2 The following statements are wrong. Underline the incorrect word/s and write down the correct statement.

1.2.1 The frontal plane divides the body vertically into left and right halves.

(2)

1.2.2 Static flexibility is the range of motion (ROM) present when a body segment is actively moved.

(2)

1.2.3 Topspin causes a tennis ball to swerve left or right.

(2)

1.2.4 Depth perception is the speed with which your brain interprets and reacts to your opponent's action.

(2)
**[18]**

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## QUESTION 2

2.1 Name the lever system in action when an athlete drops their head forward and places their chin on their chest and then returns their head back to a neutral position.

_____

(1)

2.2 Draw and label the lever system mentioned in Question 2.1 above.

(6)

2.3 Identify a sporting activity in which it would be beneficial to use …

2.3.1 a short lever

_____

(1)

2.3.2 a long lever

_____

(1)

2.4 Name AND draw the lever system involved at an ankle joint as the athlete pushes off the ground during long jump.

Name/Class of lever: _____

(1)

(6)

**[16]**

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## QUESTION 3

Read the extract below and answer the questions that follow.

The World Health Organisation reported in 2003 that the lack of physical activity is a major underlying cause of death, disease and disability. A study conducted by the World Health Organisation suggests that inactivity is one of the 10 leading global causes of death and disability. More than two million deaths each year are attributable to physical inactivity.

Research in South Africa found that one fifth of South African children smoke and that 6% lit up before the age of 10. For their smoking and eating habits, SA children got a D average!

The chief executive of Discovery Vitality stated that 'there's clearly no culture of sports participation amongst young people. Children are generally spending more time in front of a TV or on cell phones.' The report revealed that 30% of adolescent girls and 10% of boys are overweight or obese.

3.1 Provide a reason why 30% of adolescent girls are obese while only 10% of boys are.

_____

_____

_____

_____

(2)

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3.2 Identify three factors that could make access to and participation in physical activity difficult for some people AND suggest a solution to overcome each difficulty identified. *(Your answer need not relate to the provided extract only.)*

(6)

3.3 The opposite of obesity is anorexia. Provide TWO negative impacts of anorexia on athletic performance.

(2)
**[10]**

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## QUESTION 4

4.1 Explain what is meant by the term *glycaemic index*.

(4)

4.2 How can knowledge of the *glycaemic index* be of value to an athlete?

(3)

4.3 How could low blood sugar affect performance in the following athletes:

4.3.1 An archer?

(3)

4.3.2 A hockey or netball player?

(3)

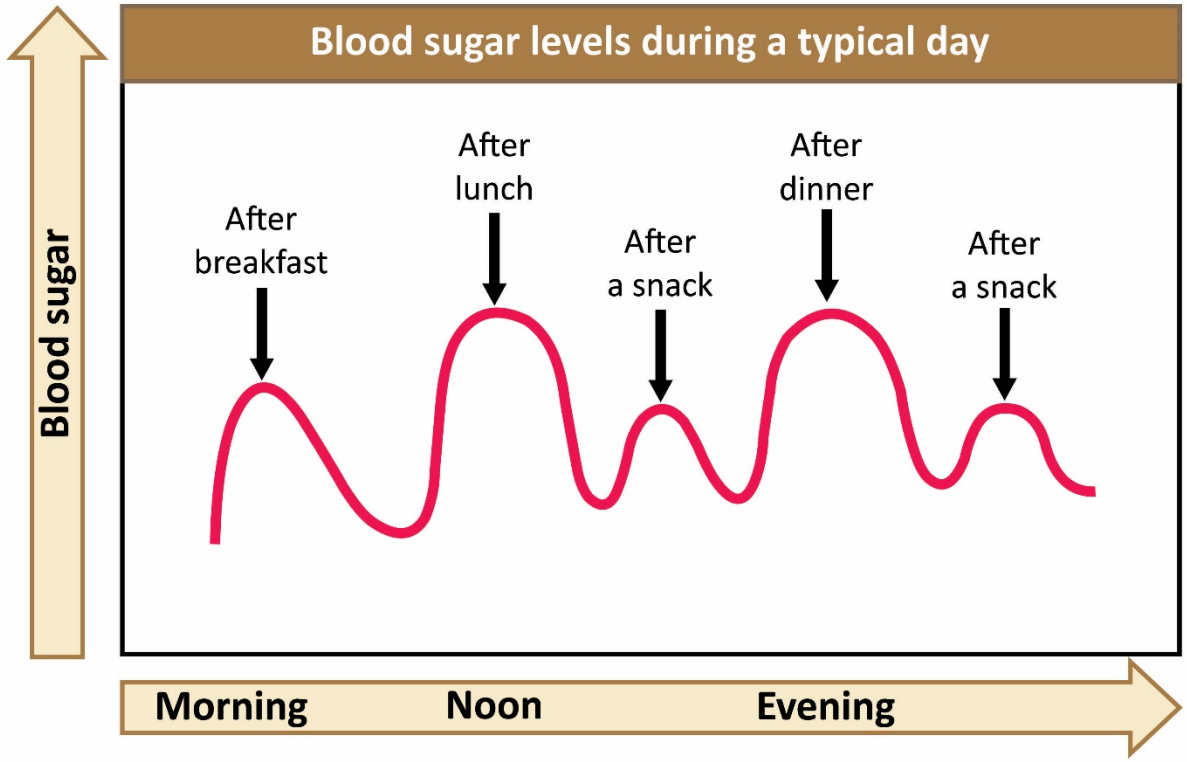
4.4 Complete the table below on the Glycaemic Index.

| | **Glycaemic index value** | **Speed of release** | **When should it be eaten?** | **Example of food type/s** |
|---|---|---|---|---|
| **High-GI foods** | 4.4.1 | 4.4.2 | After exercise that lasts 1 hour.<br>During or after exercise lasting more than 1 hour. | 4.4.3<br>4.4.4 |
| **Medium-GI foods** | 4.4.5 | Medium release | 4.4.6<br>4.4.7 | Pita bread |
| **Low-GI foods** | 55 or less | 4.4.8 | 4.4.9 | 4.4.10 |

(10)

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4.5 Examine the data in the graph below and answer the questions that follow.




[<https://www.blood+sugar+levels+during+a+typical+day>, accessed 10/9/2018]

4.5.1 Describe the diet that this athlete is following which results in the data depicted in the graph.

(5)

4.5.2 If a sprinter were to follow this diet, predict the level of performance this athlete would have after the midday meal.

(3)

4.5.3 If an endurance athlete were to follow this diet, predict the level of performance this athlete would have after the midday meal.

(3)
**[34]**

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## QUESTION 5

Read the article below and answer the questions that follow.

### Faf fined for tampering, cleared to play in Oz Test

MELBOURNE – Faf du Plessis has been found guilty of ball-tampering and fined his entire match fee from the second test against Australia, but the South African has been cleared to play in the third and final match of the series.

The 32-year-old, standing in for injured regular skipper AB de Villiers, was charged by the ICC after footage emerged that appeared to show the Protea skipper applying saliva to the ball while sucking on a sweet. 'Television footage showed an artificial substance being transferred to the ball,' the ICC said in a statement. Du Plessis had previously been sanctioned for ball-tampering after a test against Pakistan. He was then fined after he was caught on camera rubbing the ball against a zip on his pocket on the third day of the match.

The ball-tampering charge angered the South African camp, and senior batsman Hashim Amla launched an impassioned defence of Du Plessis in a public show of solidarity, with the entire team standing behind him.

[*The Witness*, 23 November 2016]

5.1 What exactly did Faf du Plessis apply to the cricket ball?

_____

_____

(1)

5.2 Why was the application of this substance considered cheating?

_____

_____

_____

(1)

5.3 Do you consider this cheating? Substantiate your answer.

_____

_____

(1)

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5.4 Why do cricket players not shine **both** sides of the cricket ball?

(1)

5.5 Was Faf's punishment adequate? Substantiate your response.

(2)

5.6 Explain coincidental timing when applied to a batsman receiving a bowled ball in cricket.

(3)
**[9]**

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## QUESTION 6

Read the sources below and answer the questions that follow.

### Source 1

**Well-oiled bikes go faster with less effort**

'Arriving at a race with a clean bike is very important to me. There is also an old saying that a clean, well-prepared vehicle or bike will always go faster and smoother – we call it free speed,' said multiple cycling champion Ashleigh Moolman Pasio.

'It's all about marginal gains. We need to use technology to assist us as much as possible.'

[Adapted from: *The Witness*, 17 September 2015]

### Source 2



[<https://www.google.co.za/cycling+drafting>, accessed 18/11/19]

6.1 How could mud on a bicycle tyre negatively impact performance?

_____

_____

_____

_____

(1)

6.2 Tour de France and other endurance race cyclists use various techniques to make the race less taxing on the body.

6.2.1 Explain why cyclists crouch down low when racing downhill.

_____

_____

(2)

6.2.2 Why are the cyclists in Source 2 pedalling in this formation?

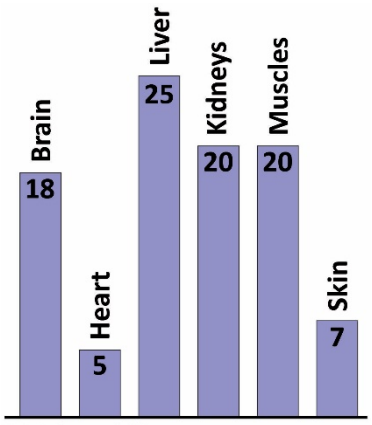
_____

_____

_____

(2)

6.3 Below is a graph depicting blood flow when a cyclist is at rest.




[<https://www.google.co.za/blood+redistribution+at+rest>, accessed 18/11/19]

6.3.1 Redraw this graph in the space below showing what blood flow to the various organs would look like while the cyclist is competing.
(The quantities do not need to be exact; the trend is the important factor.)

(4)

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6.3.2 Describe what occurs physiologically to ensure blood redistribution when exercising.

(10)

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6.4 Competing in the Tour de France means having to cope with varying weather conditions and varying altitudes. In the 2019 Tour de France the cyclists were not only caught in a heat wave but also had the race stopped for one day due to snow and ice. Some days the cyclists raced at the coast and other days they were on high mountain tops.

6.4.1 What impact does training at high altitude have on an athlete's blood?

(2)

6.4.2 There are three types of altitude training. One type is sea-level training. State the other two types of training and explain each using cycling as an example.

(4)

6.4.3 Suggest TWO strategies that a cyclist could use to cope with heat while racing in the Tour de France.

(2)

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6.5 One side effect of fatigue is the reduction in muscle and liver glycogen and blood glucose. How would this impact on the cyclist physiologically?

_____

_____

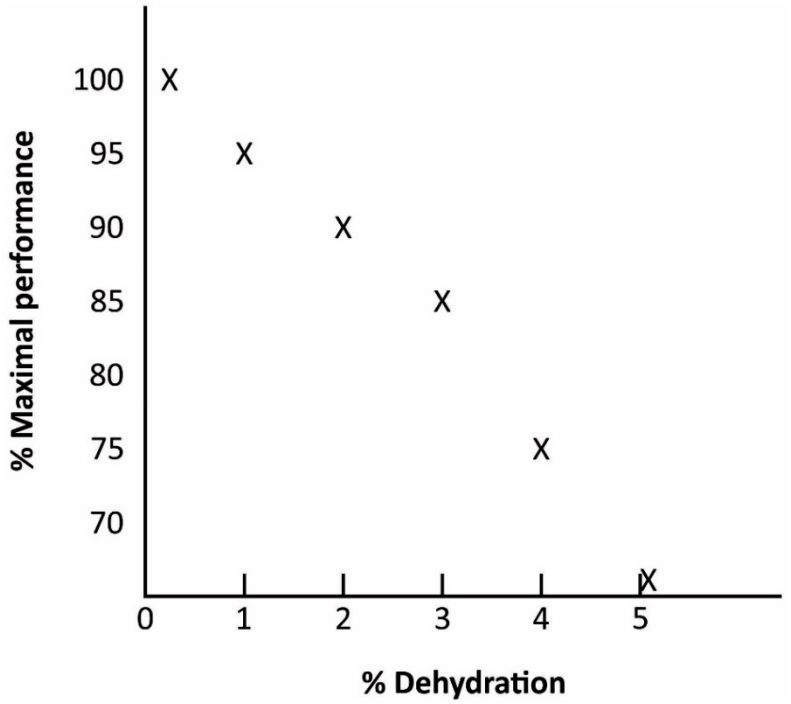
_____

(1)
**[28]**

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## QUESTION 7

It is well known that dehydration affects athletic performance negatively.




7.1 Use the graph above to discuss how fluid loss through dehydration has affected the performance of this athlete.

(5)

7.2 Describe four physiological effects of dehydration on an athlete.

(4)
**[9]**

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## QUESTION 8

At the Sydney Olympic Games in 2000, in which 10 300 athletes competed, there were 3 100 medals to be won in total, with 1000 of them being gold medals. This means that 10 300 athletes were vying for 1 000 gold medals.

8.1 Why do athletes prepare so long and so hard if most are unlikely to get gold medals?

(2)

8.2 Recommend how an athlete or a coach should prepare for the reality of losing.

(4)

8.3 List **FIVE** possible scenarios that could create anxiety in a highly trained athlete.

(10)
**[16]**

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## QUESTION 9

Read the extract below from *Serve to Win*, a book written by tennis player Novak Djokovic, and answer the questions that follow.

> In professional tennis today, the slightest change in your skill level, your physical conditioning, or your mind-set makes all the difference. I practised every morning and every afternoon, I lifted weights, I biked or ran for hours at a stretch every day.
>
> I even moved my training camp to Abu Dhabi, hoping that by practising in the sizzling heat of the Persian Gulf, I'd be better prepared for the Australian Open in Melbourne.
>
> In the quarter finals I was due to play Wilfried Tsonga, the 10th ranked tennis player in the world. I was ranked number 3. Tsonga is 91 kg of pure muscle, one of the biggest and strongest players in the game, and his serve comes in at 225 km/hr. When he puts his body weight into a return, the ball comes in with a combination of speed and topspin that feels like it could knock the racquet right out of your hand. And yet he moves with great quickness around the court.

[Adapted from: *Serve to Win* by Novak Djokovic]

9.1 Provide reasons why Novak Djokovic's training program needs to include lifting weights and cycling or running for hours given that he is a tennis player.

(4)

9.2 Explain the possible impact of training in Abu Dhabi in preparation for the Australian Open on Djokovic's physiology and psychology.

(4)

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9.3 Name the **fitness component** referred to in the extract 'Tsonga moves with great quickness around the court.'

(1)

9.4 Using examples from a tennis game, describe the first two pathways of ATP production **AND** their impact on performance. (DO NOT refer to the Aerobic System.)

(10)

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9.5 State ONE way in which the physiological signs or symptoms that Djokovic experiences when he is anxious can have both a positive **AND** negative impact on his performance.

Positive impact:

(1)

Negative impact:

(1)

9.6 Compare the laminar and turbulent air flow around a tennis ball hit by Djokovic.

(6)
**[27]**

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## QUESTION 10

10.1 Provide a definition of Newton's second law:

(3)

10.2 Explain how Newton's second law is applied in the picture below.



[<https://www.google.co.za/bicep+curl+black+male+and+white+male>, accessed 18/11/19]

(4)

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10.3 Describe the **sliding filament theory** occurring in the biceps when lifting the dumbbell.

(6)
**[13]**

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## QUESTION 11

Carefully read and examine the provided sources and the rubric. Use them to answer the following question.

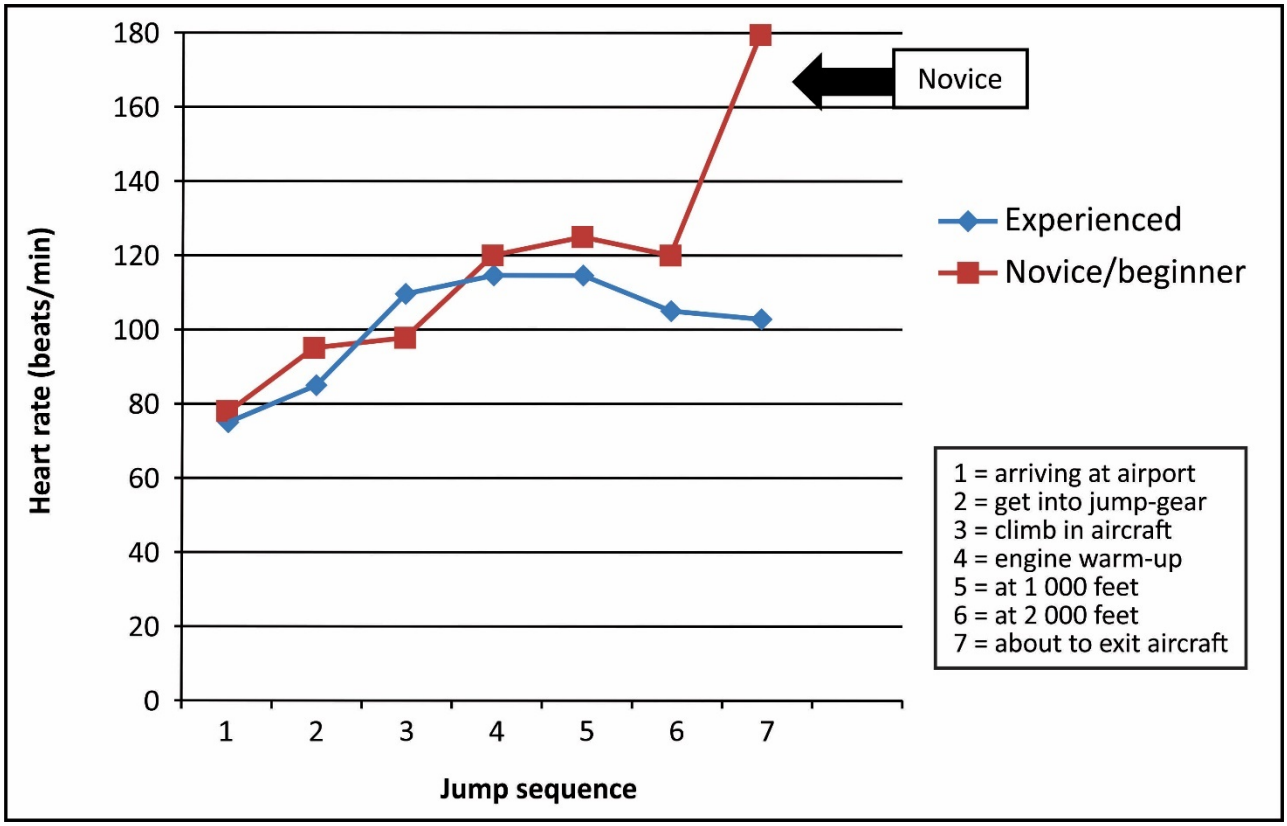
Write an essay of 1 to 1½ pages in which you discuss **arousal in sport and its impact on performance.**

To answer this question, you are expected to:

- Examine the source material carefully and use the information in the sources to best develop your essay.
- Integrate your own relevant sport science knowledge into your essay.
- Use real-life examples if applicable.

### Source A

The graph below represents the heart rate (HR) of experienced and novice parachutists. Heart rate was measured from the time of arrival at the airport to the second before exiting the aircraft.

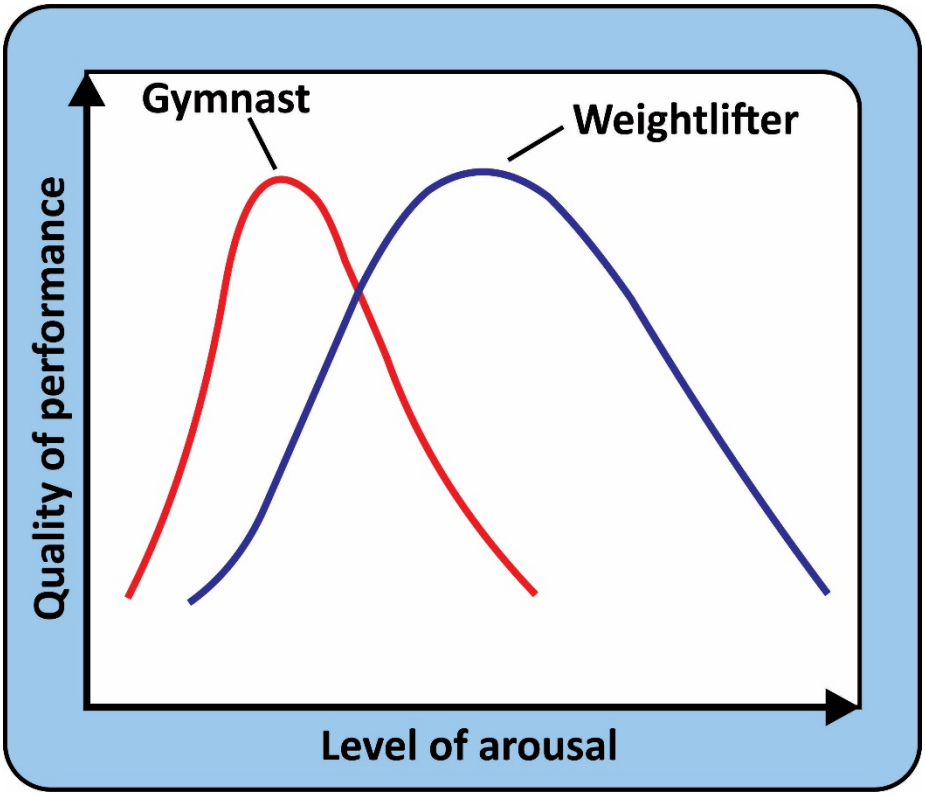



[<https://www.google.co.za/ &q=heart+rateof+experienced+and+novice+parachutists>, accessed 10/2/19]

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## Source B

**The inverted U hypothesis – Yerkes and Dodson**




[<https://www.google.co.za/ yerkes+dodson+curve+gymnast+weightlifter>, accessed 18/11/19]

## Source C

### Failure to handle pressure behind Sharks' shock loss

Though Sharks attack coach David Williams doesn't suspect a lack of commitment during their surprise defeat to the Pumas at the weekend, he acknowledges that the Durban outfit still don't know how to handle pressure.

Now they need to dig deep this coming Saturday against the third-placed Cheetahs at King's Park if they are to stand any realistic chance of defending the title.

'For us, the lesson that must be learned is how to cope with pressure.'

[Adapted from: *The Witness*, 6 July 2019]

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## Source D

### South Africa's cricketers battle image as 'chokers'

The legendary Jacques Kallis has dismissed a widely held view that the Proteas are still haunted by their 'chokers' tag at the World Cup.

A veteran of five tournaments, Kallis experienced some of SA's most painful moments, notably 1999's infamous semi-final run out and 2003's Duckworth-Lewis fiasco in Durban, which saw the national side crash out of the tournament.

'Of course you're aware of the *chokers** tag the team is labelled with but the players don't worry too much about it. You realise that when you play international sport, if things don't go well for you then you are going to catch some criticism – that's fair enough. You have to look beyond it, said Kallis.

[Adapted from: *The Citizen*, 27/5/19]

*choker – a player who fails to perform at a crucial point as a result of nervousness.

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| | 0 marks | 1 mark | 2 marks | 3 marks | 4 marks | Possible mark (20) |
|---|---|---|---|---|---|---|
| **Use of sources.** | No reference to sources. | Reference made to some sources only. | Source detail used to nearly full potential to support the discussion and impact on performance. | | | 2 |
| **Content relevance × 2.** | Little or no content relevance. | Significant important information missing AND facts not related closely to the topic AND some serious factual errors. | Some vital information missing OR many irrelevant facts OR errors affecting the quality of the essay. | Slightly flawed in some facts missing OR facts mostly relevant to topic OR few errors. | Sufficient facts provided. All information is relevant and accurate. | 8 |
| **Real-life examples × 2.** | No examples provided. | Inappropriate or weak examples provided. | Two real-life examples provided. | More than two real-life examples provided. | Examples used to nearly full potential to support the discussion and impact on performance. | 8 |
| **Quality of discussion.** | Question not answered. Missed the point. | Reasoning correct but hard to follow. Some linkage evident. | Reasoning is very clear and succinct. Flow is logical. Compelling with regular linkage. | | | 2 |

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**[20]**

**Total: 200 marks**

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**ADDITIONAL SPACE (ALL questions)**

**REMEMBER TO CLEARLY INDICATE AT THE QUESTION THAT YOU USED THE ADDITIONAL SPACE TO ENSURE THAT ALL ANSWERS ARE MARKED.**

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