Please paste the barcoded label here

TOTAL MARKS

NATIONAL SENIOR CERTIFICATE EXAMINATION
MAY 2025

SPORT AND EXERCISE SCIENCE

EXAMINATION NUMBER

Time: 3 hours 200 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 36 pages. Please check that your question paper is complete.
2. **Answer all questions on the question paper and hand it in at the end of the examination. Remember to write your examination number in the space provided above.**
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 35–36) 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	**Total**
Marks	23	8	37	28	28	14	30	12	20	**200**
Obtained										

N12SPSC-1-E

IEB Copyright © 2025

QUESTION 1

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

COLUMN A	COLUMN B	
1.1.1 Heat exhaustion	A	Eating or drinking enough carbohydrates on a daily basis to maximise glycogen storage.
1.1.2 Ketogenic diet	B	Develops the ability of an athlete to use oxygen better.
1.1.3 ATP	C	Used for long-term physical activity.
1.1.4 Lactic acid system	D	Used for immediate physical activity.
1.1.5 Carbohydrate loading	E	Caused by the combined effects of heat and dehydration.
1.1.6 ATP-PC system	F	High fat, moderate protein, and low carbohydrate foods.
1.1.7 Aerobic energy system	G	Used for short-term physical activity.
1.1.8 Altitude acclimatisation	H	A chemical compound responsible for producing energy.

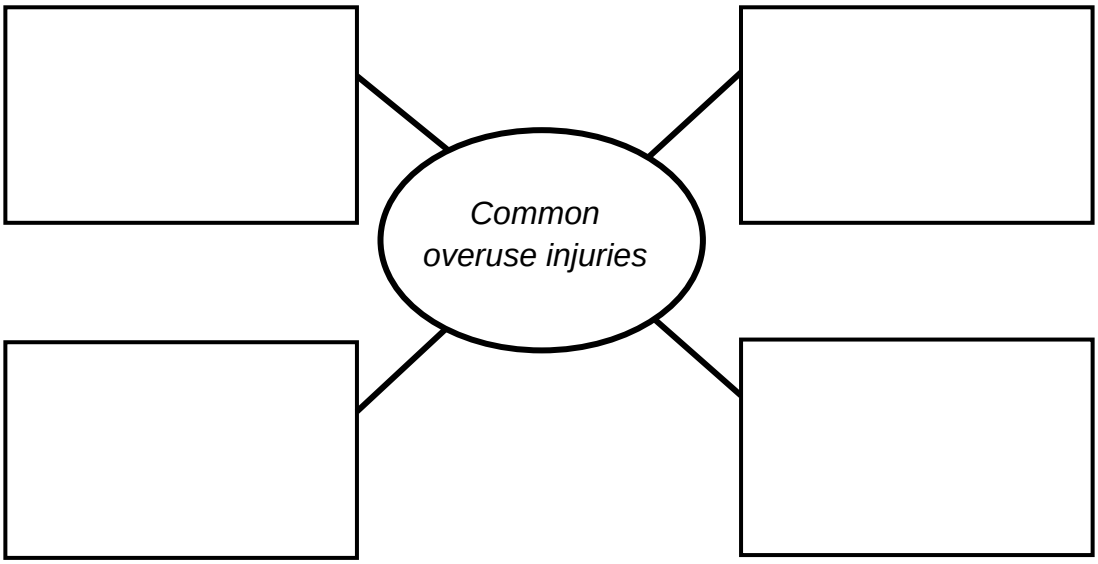
ANSWERS:

1.1.1	
1.1.2	
1.1.3	
1.1.4	
1.1.5	
1.1.6	
1.1.7	
1.1.8	

(8)

IEB Copyright © 2025

1.2 1.2.1 List common overuse injuries encountered in sports by completing the following diagram.



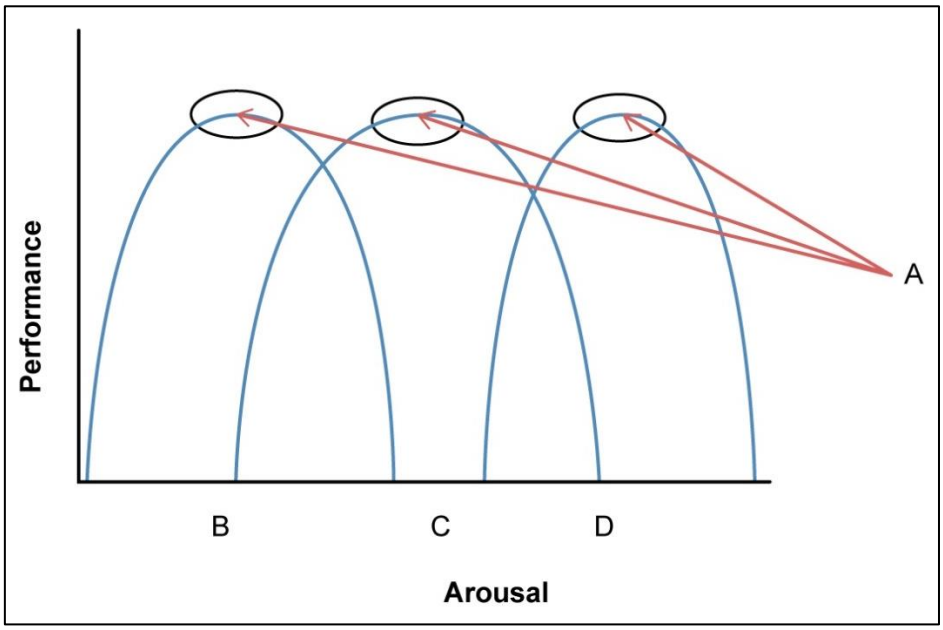
(4)

1.2.2 Select **TWO** overuse injuries you listed in question 1.2.1 above and complete the table below.

Name of overuse injury	Specific cause of injury – what sporting action caused injury	State the physiological damage that occurs.
	(1)	(2)
	(1)	(2)

IEB Copyright © 2025

1.3 Examine the graph below illustrating arousal in sport and answer the questions that follow.



[Source <https://www.torpoint.cornwall.sch.uk/wp-content/Arousal-Aggression-Motivation-and-Personality>]

1.3.1 Explain what the three arrows, depicted with A, represent.

_____

(2)

1.3.2 Provide a sport type most suited for each curve depicted by B, C, and D.

B = _____

C = _____

D = _____

(3)
[23]

IEB Copyright © 2025

QUESTION 2

2.1 OUTLINE and SHADE the base of support in the following pictures.

Picture A



[Source: <https://1st_FIG_Artistic_GymnasticsMen%27s_All-around_competition__Floor_exercise_%28Martin_Rulsch>]

(3)

Picture B



[Source: <https://www.checkyeti.com/blog/en/tag/skiing-technique/page/2>]

(3)

IEB Copyright © 2025

2.2 Place a ● where this athlete's centre of gravity would be positioned AND draw the line of gravity on the following picture.



[Source: <https://www.top-11-jamaican-track-and-field-athletes>]

(2)
[8]

IEB Copyright © 2025

QUESTION 3

Examine the picture provided below and then answer the questions that follow.

Novak Djokovic



[Source: <https://www.sportico.com/personalities/ athletes/2022/>]

3.1 Use the picture above to explain the function of a Golgi tendon organ.

(6)

IEB Copyright © 2025

3.2 Use the picture on page 8 to explain the function of the muscle spindles in Djokovic's arms.

(6)

3.3 Describe how reciprocal inhibition in Djokovic's leg muscles helps lower the risk of a leg injury.

(3)

IEB Copyright © 2025

3.4 Provide two factors that have an impact on an athlete's joint flexibility.

- _____

_____

- _____

_____

(2)

3.5 Describe the correct stretching technique to reduce or inhibit the myotatic reflex.

_____

_____

_____

_____

_____

_____

_____

(3)

3.6 In the Wimbledon final, Djokovic utilised various tactics to defeat his opponent, one of which was applying spin to the ball when returning shots. Compare the flight patterns and effects of the three different types of spin he could use.

_____

_____

_____

_____

_____

_____

_____

_____

_____

(3 x 3 = 9)

IEB Copyright © 2025

3.7 Which factor has the most impact or effect on a tennis ball?

(2)

3.8 Explain how Djokovic's understanding of various glycaemic index (GI) foods can support his preparation and performance.

(6)
[37]

IEB Copyright © 2025

QUESTION 4

Read the source below and answer the questions that follow.

> Understanding energy systems is crucial for long-distance runners because it enables them to optimise their training and performance. The primary energy systems can play a role in different phases of running. By understanding how these systems function and interact, runners can tailor their workouts to improve endurance, manage their energy reserves more effectively during races, and enhance recovery.

[Source: Examiner's adaptation]

4.1 What are the three primary energy systems?

(3)

4.2 Describe the interaction of energy systems during a long-distance running event and evaluate how their contributions adapt to varying intensities throughout the race.

(7)

IEB Copyright © 2025

4.3 When tailoring their workouts, what type of training could an athlete do in order to delay the threshold between energy systems?

(1)

4.4 Briefly explain how this type of training impacts ATP/PC stores.

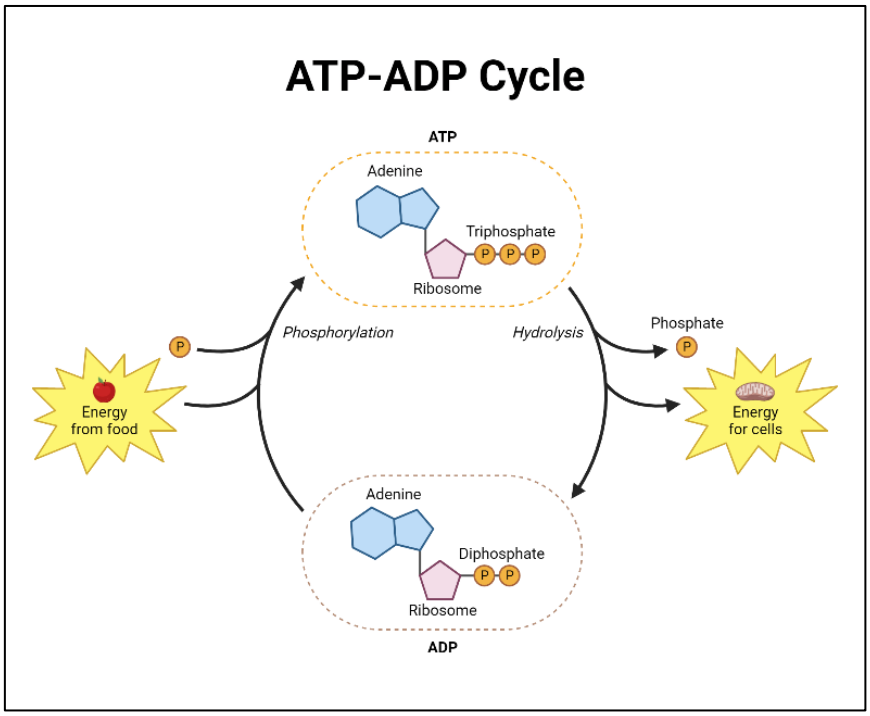
(2)

4.5 How would the delay on the threshold benefit the athlete's performance?

(1)

IEB Copyright © 2025

4.6 Use the picture below to explain the ATP and ADP cycle.



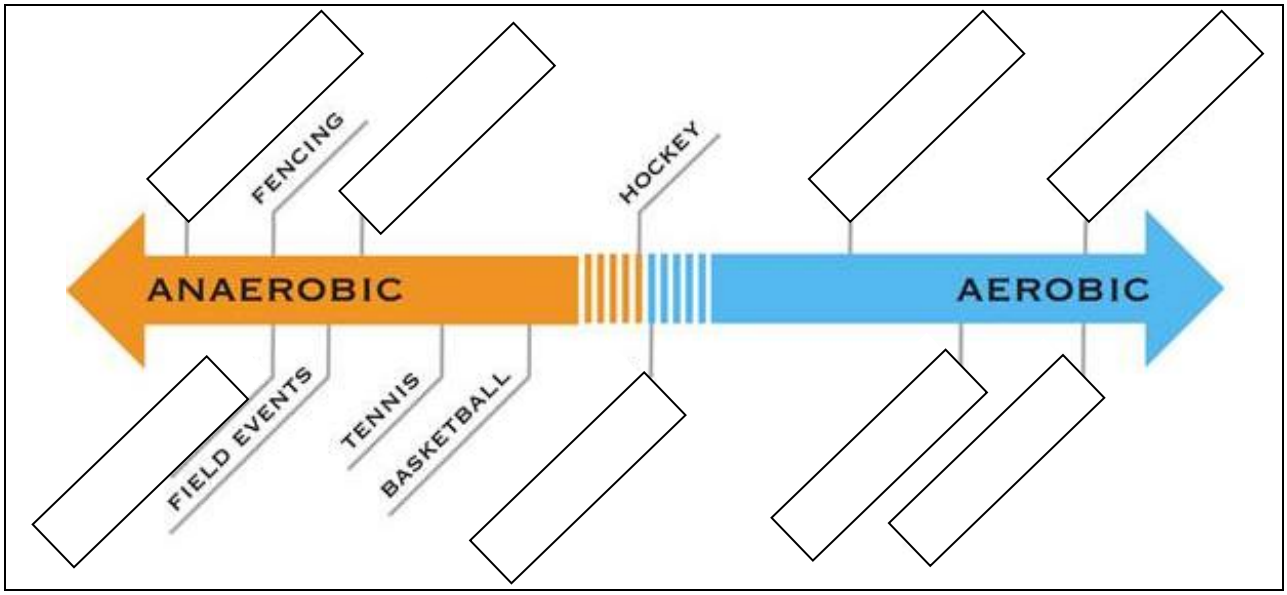
[Source: <https://www.biorender.com/template/atp-adp-cycle>]

(6)

IEB Copyright © 2025

4.7 On the line below, indicate approximately where the following sports would be placed when comparing energy system requirements.

- Golf swing
- Volleyball
- Skiing
- Distance running
- Sprinting
- Rowing
- Swimming 1500 m
- Soccer



[Source: <https://www.advancedwellness.com/>]

(8)

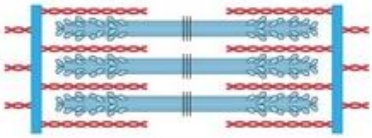
[28]

IEB Copyright © 2025

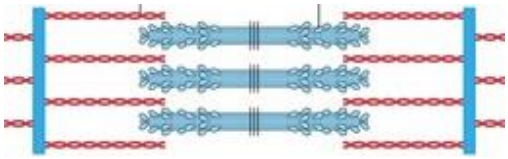
QUESTION 5

5.1 Examine the pictures of a sarcomere below and answer the questions that follow.

Picture A



Picture B



[Source: <https://www.labeled+sarcomere&stick>]

5.1.1 Which picture depicts a relaxed muscle, and which depicts a contracted muscle?

Relaxed: _____

Contracted: _____

(2)

5.1.2 Label an actin filament and a myosin filament on **picture A**.

(2)

5.1.3 Indicate the Z line on **picture B**.

(1)

5.1.4 Briefly explain why a muscle contraction is referred to as 'the sliding filament' theory.

_____

_____

_____

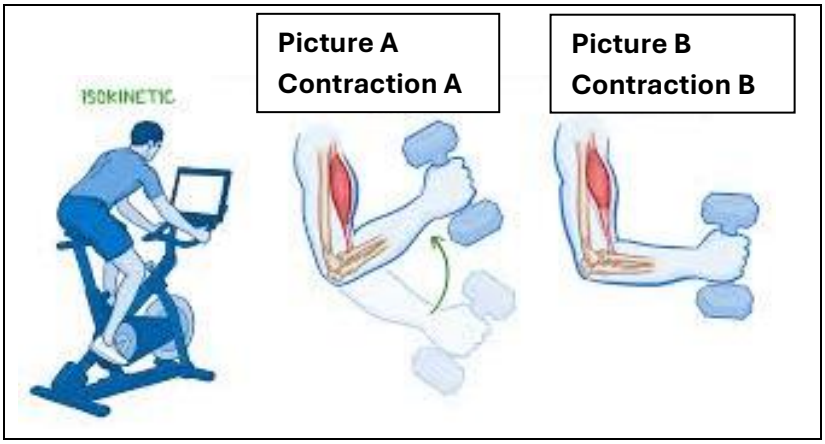
_____

_____

(3)

IEB Copyright © 2025

5.2 Examine the picture below on muscle contractions.



[Source: <https://www./Biomechanics:_Muscle_contractions>]

5.2.1 Which picture represents a static contraction?

_____

(1)

5.2.2 Which picture represents a dynamic contraction?

_____

(1)

5.3 Examine the picture below and answer the questions that follow.



[Source: <https://www.google.com/search?=lifting+weight+heavy+or+light>]

5.3.1 What is a motor unit?

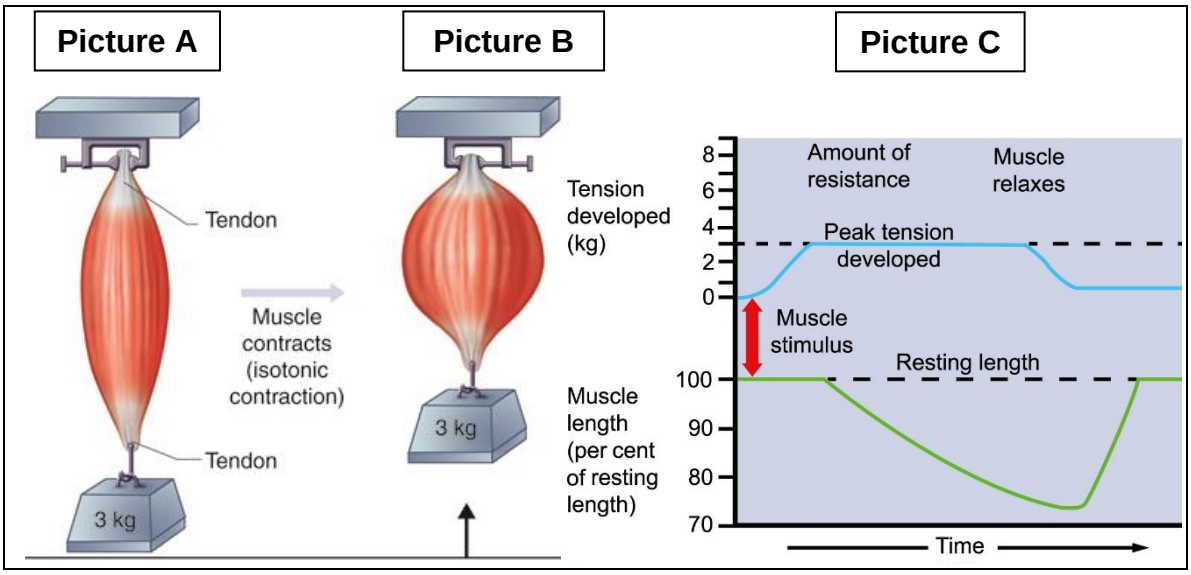
(5)

5.3.2 Use the picture provided to explain muscle fibre recruitment and the All-or-None law.

(6)

IEB Copyright © 2025

5.4 Interpret the data in the pictures below representing an isotonic contraction.

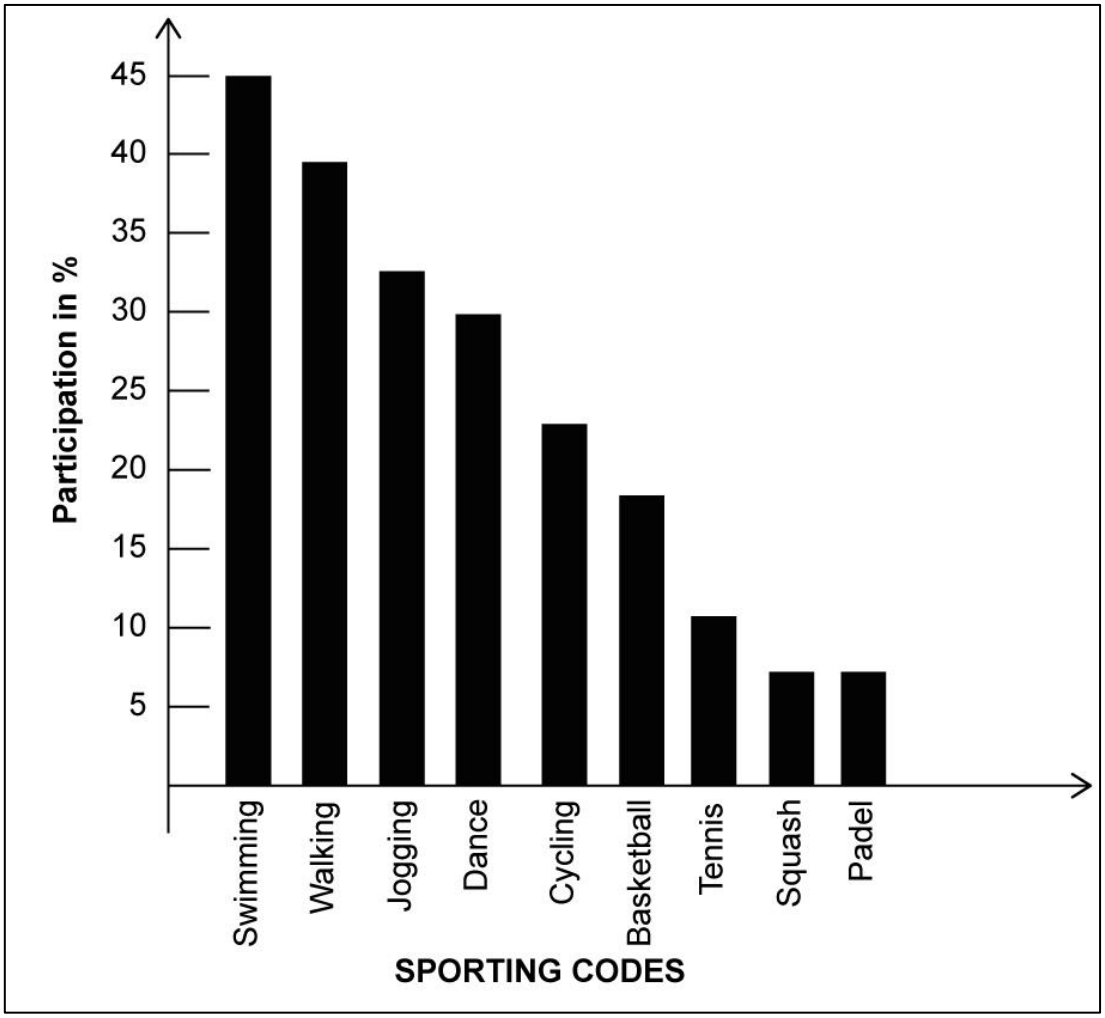


[Source: <https://www.nursinghero.com/study-guides/muscle-structures-and-functions>]

(7)
[28]

QUESTION 6

Examine the graph below illustrating sport participation in South Africa and answer the questions that follow.



[Source: Examiner's adaptation]

6.1 Name the three most popular activities.

_____

_____

_____

(3)

6.2 Provide two possible reasons for the top 3 activities being so popular.

- _____

_____

- _____

_____

(2)

IEB Copyright © 2025

6.3 Name two sports that are popular and played by a large majority of South Africans but not named in the provided graph.

_____

_____

(2)

6.4 Why do you think Squash and Padel have the same number of participants?

_____

_____

(1)

6.5 Name and explain two situational factors affecting exercise adherence.

Factor 1: _____

(1)

Explanation:

_____

_____

_____

_____

(2)

Factor 2: _____

(1)

Explanation:

_____

_____

_____

(2)
[14]

IEB Copyright © 2025

QUESTION 7

7.1 Use each of the following pictures to explain the concept of 'stability'.

A



[Source: <https://www.wikihow.com/Do-Side-Splits>]

B



[Source: <https://www.google.com/=clipart+split+handstand+on+beam&u>]

C



[Source <https://www.google.com/=male+handstand>]

D



[Source: <https://www.google.com/australia+vs +france+rugby&>]

IEB Copyright © 2025

(10)

IEB Copyright © 2025

7.2 Explain how a gymnast competing on the vault would use both linear momentum and angular momentum.

(4)

7.3 Describe each of Newton's Laws using either rugby or netball in the explanation.

Description of Law 1:

(2)

Application:

(2)

IEB Copyright © 2025

Description of Law 2:

(2)

Application:

(2)

Description of Law 3:

(2)

Application:

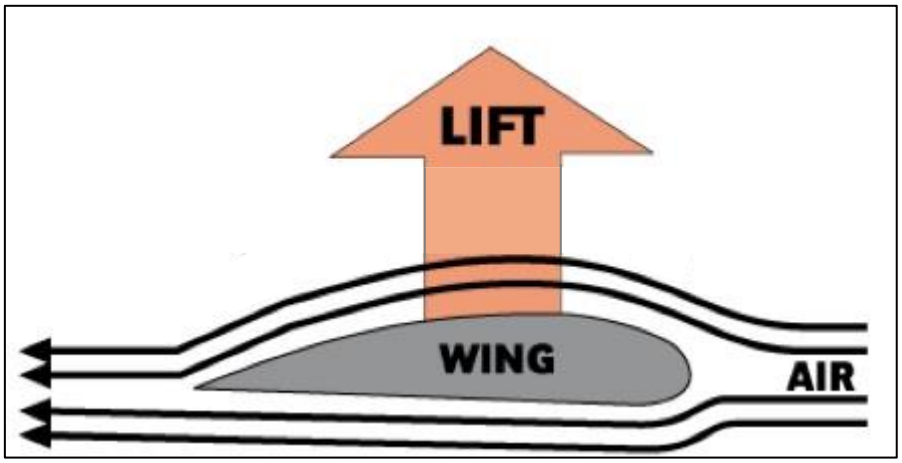
(2)

IEB Copyright © 2025

7.4 Label the diagram below depicting the Bernoulli Principle.

Place the following labels on the diagram

- High pressure
- Low pressure
- High speed air movement
- Low speed air movement



[Source: Examiner's adaptation]

(4)
[30]

IEB Copyright © 2025

QUESTION 8

Read the sources below and answer the questions that follow.

Source A

Disabled athletes: do they have an advantage?

Oscar Pistorius is a double amputee sprinter who set world records in the 100 m, 200 m and 400 m at the Paralympics in 2004. He then applied to compete at the able-bodied 2008 Olympics, but the IAAF had reservations about letting him. They said he has an unfair advantage and they might be right.

Pistorius runs with two curved prosthetic racing legs made of carbon fibre. According to the IAAF they provide less air resistance than a human leg would and allow him to distribute energy differently.

[Source: Huff Post, July 2007]

Source B

World's fastest blade runner gets no competitive advantage from prostheses, study shows.

A study was conducted on various athletes with bilateral leg amputations. An expert in running prostheses biomechanics was enlisted to conduct the study.
On the treadmill and track, he measured acceleration out of the starting blocks, maximum speed along a straight line and around curves, velocity at aerobic capacity and sprint endurance (all-out effort). They took the results from all available data from elite bilateral amputees and compared them to the results from non-amputees.
'We found that no athlete with prosthetic legs has ever performed better than an elite non-amputee athlete in lab-based experiments in any measure that relates to sprinting performance.'

Athletes using prosthetics were 40% slower out of the starting blocks, had 19% slower velocity at aerobic capacity, and were 1–3% slower around curves compared to non-amputees.

[Source: University of Colorado Boulder, published 5 Jan 2022]

8.1 Source A mentions that the prosthetic legs 'provide less air resistance'.

Explain why a prosthetic leg would generate less air resistance.

_____

_____

_____

_____

(2)

8.2 Explain why an athlete with prosthetic legs might be 40% slower out of the starting blocks compared to an able-bodied athlete.

(2)

8.3 Why might a scientist choose to test the runner's speed 'around curves' as well as straight-line sprints?

(2)

8.4 State why an athlete with prosthetic legs is 1–3% slower when running around curves.

(2)

8.5 Use a 400 m sprint race to explain the difference(s) between oxygen debt and oxygen deficit.

(4)
[12]

IEB Copyright © 2025

QUESTION 9

Examine the information provided in the sources below. Use this to write an essay of 1–1½ pages on the following topic:

Does a long-term athlete development plan provide a clear path to better sport, greater health and higher achievement?

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.
- Use real-life examples where applicable.
- Make use of the rubric to shape your response.

Source A

Early vs Late Specialisation: When should children specialise in sport?

There is no single pathway to success in sport. If there were, we wouldn't be able to compare the stories of Chrissie Wellington, who discovered her remarkable talent late in life but went on to dominate the IronMan Triathlon within a few years, to that of another endurance athlete, Floyd Landis, who began cycling at school, with a single-minded focus that took him to the professional level many years later. There are countless cases of both examples, not only in endurance sports but also in skill-based sports – cricket or rugby players who 'arrive' in their 20s, compared to the 'prodigies' who are earmarked for success from their early teenage years or even earlier.

If it took starting at the age of 4, with a parent driving a child to train for hours a day (think Agassi, Woods), then we wouldn't have cases like Roger Federer, who showed exceptional tennis ability very young but did play other sports *(on this note, Federer is reported to have begun at 6, but played football and tennis until he focused on tennis at 12 – this is still young, but it's not nearly as early as other cases of tennis players. Compare Agassi, who spent hours a day practising at 6 years old and who even played a match for money at the age of 9, at his father's 'request'.)*

[Source: Examiner's adaptation]

Source B

LTAD divides the path from a child to a professional into a number of stages. For each stage, the focus, the role of the coach, and the responsibilities of the player vary. In the LTAD model, serious competition is delayed until after adolescence. This has repercussions on where the sport fits within society and the management of various stakeholders. In fact, it is this balance between competition (which society demands) and the LTAD proposed delay in competition that is likely to be the source of most 'tension', and thus failure, within the model.

[Source: Science of Sport, Dr Ross Tucker]

IEB Copyright © 2025

Source C

I spend a lot of time speaking with parents of young players who got cut from a team because they were a bit small, a bit slow, or not good enough to help their team win yet. These families want to know what to do next, and I encourage them to take a long-term perspective and do things to keep their kids involved and playing.
But what about if the shoe is on the other foot? What if your son or daughter is the elite player, the coach's favourite, the one who plays all the games and never gets subbed? What then?
Only about 10% of elite 10-year-old athletes are still elite at 18. In fact, the only thing that early success guaranteed is … early success.

[Source: John O'Sullivan, Soccerwire.com]

IEB Copyright © 2025

ESSAY RUBRIC

	0 marks	1 mark	2 marks	3 marks	4 marks	Possible mark (20)
Use of sources	No reference made to sources.	Attempted to use sources, BUT no integration.	Not all sources used but those used were integrated.	Full use of sources but not fully integrated or expanded on.	Full use of sources integrated into the discussion with understanding.	**4**
Response to question/ statement	No attempt made in response to the question / statement.	Attempted to discuss **either** benefits or limitations of LTAD **OR** response is weak.	Some content on **benefits and limitations** provided but not integrated **OR** both are mentioned with limitations **OR** either benefits or limitations are superficially discussed.	Some of the content provided is relevant and integrated **AND** both the benefits and limitations of LTAD are mentioned.	All the content provided is relevant **AND** the benefits and limitations of LTAD are fully discussed, with clear links to sport, health, and achievement.	**4**
Use of own knowledge x 2	Very few relevant facts and much inaccuracy. Missed the point.	Significant info missing **AND** factual errors **AND** lots of irrelevant info included.	Some info missing **OR** errors evident **OR** some irrelevant info included.	Response shows sufficient detail that is factually correct and relevant with integration.	Response shows in-depth use of knowledge that is factually correct and relevant with integration.	**8**
Quality of discussion	Missed the point of the discussion.	Reasoning is hard to follow. Rambling and repetitive. Little linkage evident.	Reasoning is evident but there is loss of focus. Repetitive. Thoughts are often weakly linked.	Response is clear, compelling and cohesive with minor repetition or loss of focus.	Reasoning (logic) is very clear, response is to the point, cohesive and compelling.	**4**

[20]

IEB Copyright © 2025

PLANNING PAGE:

IEB Copyright © 2025

ESSAY:

IEB Copyright © 2025

[20]

IEB Copyright © 2025

ADDITIONAL SPACE (ALL QUESTIONS)

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

IEB Copyright © 2025

IEB Copyright © 2025