



SPORT AND EXERCISE SCIENCE: PAPER I

EXAMINATION NUMBER

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Time: 2 hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

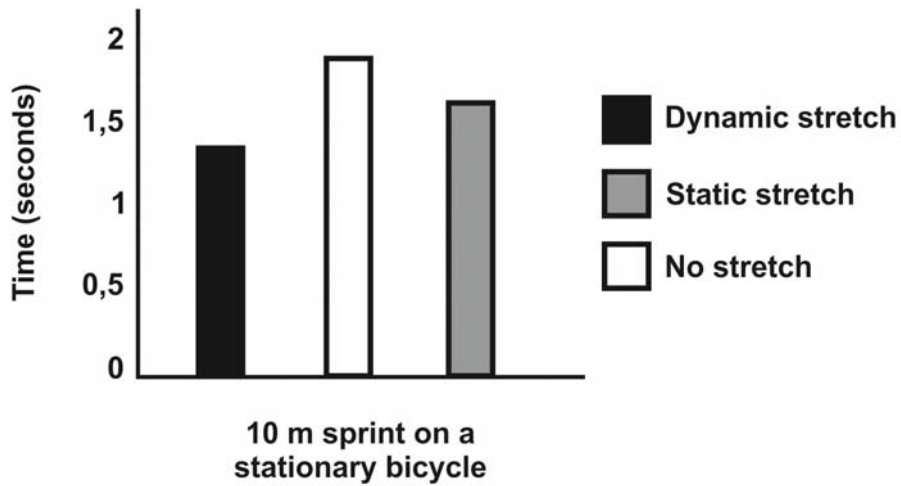
1. This question paper consists of 23 pages. Please check that your question paper is complete.
2. All the questions must be answered on the question paper.
3. Read the questions carefully.
4. Use the total marks awarded for each question as an indication of the detail required.
5. It is in your own interest to write legibly and to present your work neatly.

Question	1	2	3	4	5	6	7	8	9	10	11	Total
Marks												

QUESTION 1

Appropriate and adequate warming up before exercise can increase performance execution. However, there is a debate around whether a warm-up should include dynamic or static stretching.

Examine the graph below which represents the performance of a stationary 10 m sprint on a stationary bicycle for an athlete following different warm-up techniques consisting of static stretching, dynamic stretching and no stretching.



[Graph created by examiner]

1.1 Explain the difference between dynamic and static stretching techniques.

(2)

1.2 Provide **TWO** physiological reasons which could account for the performance times shown in the graph above.

(2)

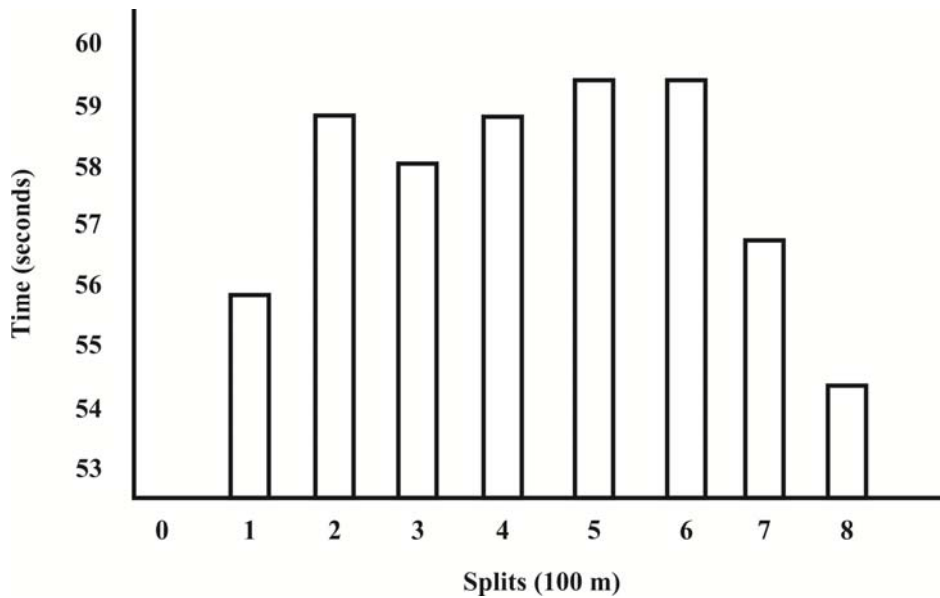
1.3 Refer to the graph and motivate why dynamic stretching appears to be the preferred technique for sprinters.

(2)
[6]

QUESTION 2

At a recent International Swimming Federation (**FINA**) World Cup event, Cameron van den Bergh swam the 800 m Freestyle in a time of 7 minutes, 41 seconds.

The graph below records the split times for every 100 m.



[Graph created by examiner]

2.1 Identify the predominant energy systems used by Cameron during the following stages of the race:

2.1.1 The first 10 m of the race : _____

2.1.2 At split 4 : _____

2.1.3 At split 8 : _____ (3)

2.2 Identify the source of fuel used to contribute to energy production during the 5th and 6th splits.

_____ (1)

2.3 Estimate the overall percentage (%) of energy supplied by the aerobic system in this event.

_____ (1)

2.4 Name **TWO** anatomical factors that might have contributed to Cameron's success in this event.

 _____ (2)

2.5 Identify the training method that Cameron would apply in the two months preceding a major event. Motivate your answer.

(2)

2.6 List the cardiovascular changes that would occur to Cameron as a result of his intense training for this event.

(3)

2.7 To achieve this world-class performance, Cameron and his coaching staff would have applied all of the Principles of Training listed below in their rigorous **swimming training programme**.

Select **THREE** principles from the list below and describe how these would be applied in his training programme.

- Duration
- Frequency
- Intensity
- Adaptation
- Specificity
- Progressive Overload

Principle 1: _____

(4)

Principle 2: _____

(4)

Principle 3: _____

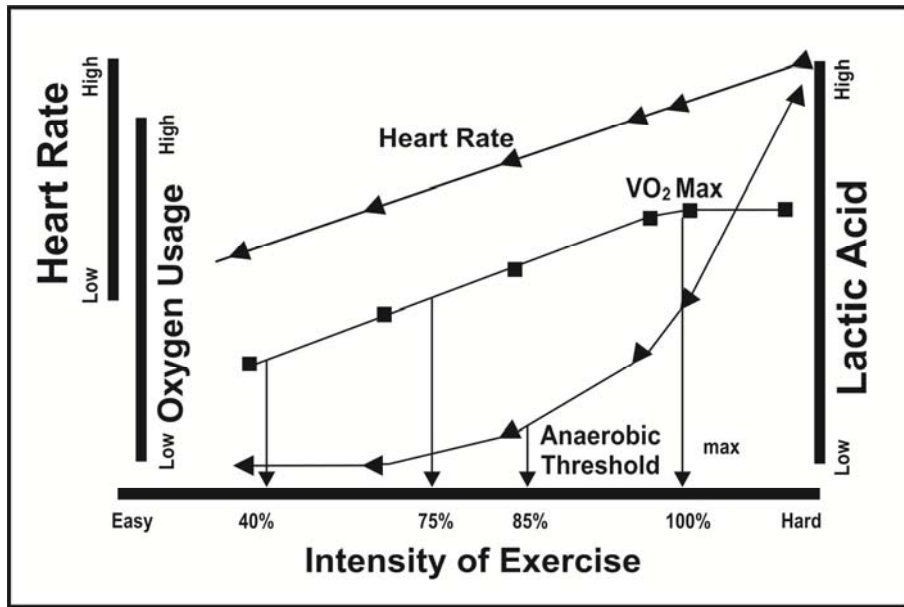
(4)

2.8 Explain why on-going monitoring of an athlete in training is important.

(4)

[28]

QUESTION 3



[<<http://www.mhhe.com/socscience/hhp/webreview/Web14/Web14.htm>>]

3.1 The graph above illustrates the relationships among Heart Rate (HR), oxygen consumption ($VO_{2 \text{ max}}$) and Lactic Acid (LA) production as the intensity of exercise increases.

Explain these relationships.

3.2 *Tour de France* cyclists are known to have a high VO_{2max} of 85 ml/kg/min compared to unfit, recreational cyclists who are known to have a VO_{2max} of 45 ml/kg/min.

Explain the meaning and physiological advantage of the value: 85 ml/kg/min for these elite athletes.

(4)

3.3 Endurance athletes, especially *Tour de France* cyclists should train at altitude.

Explain why, from a physiological and timing perspective, altitude training may improve performance in endurance athletes.

(4)

3.4 Explain how the accumulation of Lactic Acid (LA) [Lactic Acidosis] in a *Tour de France* cyclist's quadriceps limits performance.

(4)

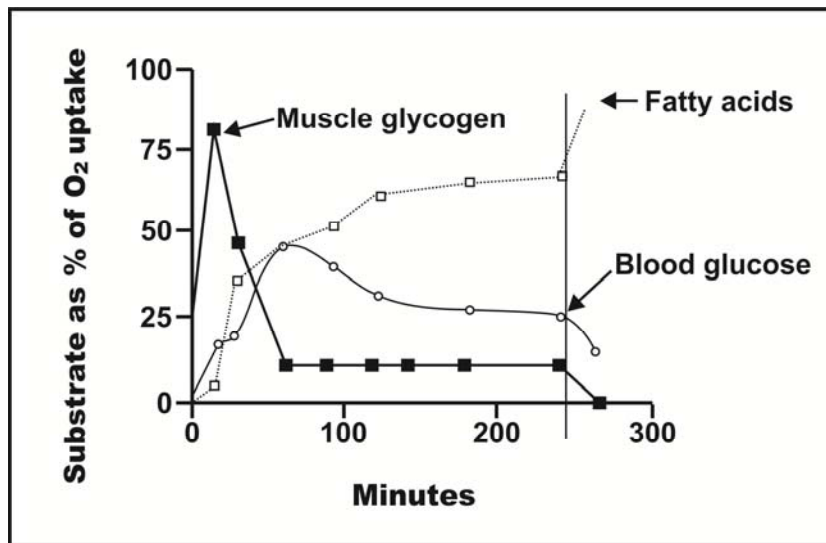
3.5 Sustained oxygen consumption in endurance-type events, such as the *Tour de France*, pre-disposes the condition known as: Excess Post-Exercise Oxygen Consumption (EPOC).

Explain the importance of recovery for athletes, such as *Tour de France* cyclists.

(4)

[22]

QUESTION 4



[<<https://www.google.mitochondria>>]

The graph above illustrates when energy sources in working muscle, relative to exercise duration and choice of substrate, are utilised.

4.1 Name the source of energy during the first half hour.

_____ (1)

4.2 After 30 minutes of exercise which **TWO** energy sources sustain the demands of exercise for the next 60 minutes?

 _____ (2)

4.3 Is sustained exercise after 4 hours possible for this athlete? Motivate your answer.

 _____ (2)

4.4 What is the most effective source of fuel to replenish energy stores after an athlete has completed a half marathon event in 90 minutes?

_____ (1)

4.5 Is restoring muscle glycogen, for sprint events, best sourced from carbohydrates or proteins?

_____ (1)

4.6 Which macronutrient will optimise muscle health, tissue repair and the maintenance of lean body mass?

_____ (1)

4.7 Complete the following table relating to energy systems:

Duration of activity	Major energy system/s used
Longer than 3 minutes	
30 seconds – 1½ minutes	
Less than 10 seconds	

(1)

(1)

(1)

4.8 Complete the table below, listing the number of ATP molecules produced in each stage of the Aerobic System.

	Number of ATP produced
Aerobic Glycolysis	
Electron Transport Chain	
Krebs Cycle	

(3)

[14]

QUESTION 5

When designing a training programme for an elite athlete, an informed coach will plan the year around cycles/phases.

Assume a training programme is needed for a soccer or tennis athlete. Select and apply **THREE** cycles to structure an appropriate training programme for this athlete. You can use a diagram to assist in your explanation.

SPORT SELECTED: _____

QUESTION 6

There are many socio-economic factors that have an impact on participation in sport and physical activity.

6.1 Complete the following table by providing **ONE** example that promotes participation and **ONE** example that inhibits participation for each factor provided.

FACTOR	PROMOTES PARTICIPATION	INHIBITS PARTICIPATION
Socially acceptable attitudes and practices	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> (1)	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> (1)
Institutional rules and regulations	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> (1)	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> (1)
Current economic climate	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> (1)	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> (1)

<p>Environmental conditions</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(1)</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(1)</p>
<p>Value-orientation, ethics and moral philosophy</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(1)</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(1)</p>
<p>Religion, customs and cultural practices</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(1)</p>	<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <p>(1)</p>

6.2 Physical activity participation trends vary with age and gender.

6.2.1 Discuss how age has an impact on participation in physical activity.

(4)

6.2.2 Discuss how gender has an impact on participation in physical activity.

(4)
[20]

QUESTION 7

Swimming in oceans of ice – polar swimmer, Lewis Gordon Pugh is a phenomenon.

Polar-ice swimmer, Lewis Gordon Pugh, became the first person in the world to finish a long distance swim in the freezing Arctic Ocean. Wearing just a Speedo swimming costume and a cap, Pugh completed an extreme swim.

His preparation for this extreme swim was managed and assisted by a team of scientists, including the world-renowned Sport Scientist, Professor Tim Noakes.

His genetic endowment, cold water adaptation and personal drive helped keep his body temperature within safe limits. According to Noakes, Pugh is able to swim in temperatures that would disable most people within seconds.



[<<http://lewispuh.com/>>, Accessed 9/4/14]

7.1 Define **hypothermia** and explain the physiological risks of this condition.

(3)

7.2 What are the **psychological** effects of hypothermia and how do these effects limit performance?

(2)

7.3 Why are 'extreme athlete' endeavours, such as Pugh's Arctic swim, of interest to Sport Scientists?

(3)

7.4 South Africa's role in the 2014 Winter Olympic Games was limited.

Provide **ONE** factor, different for each of the following Winter Olympic events that limited South African participation:



[<<http://topendsport.com>>, Accessed 9/4/14]

- Curling

(1)

- Ice hockey

(1)



[<<http://nypost.com/skeleton-racer-katie-uhlaender>>, Accessed 9/4/14]

- Skeleton

(1)
[11]

QUESTION 8

If athletes, running the Comrades Marathon, took liquid at every refreshment station, the chances of overhydration and hyponatremia (EAH) are likely.

- 8.1 Explain the **physiological** symptoms of overhydration.

(4)

- 8.2 Explain the **psycho-physiological** symptoms of dehydration.

(4)

- 8.3 Urine colour is a useful indicator of hydration levels. Explain.

(2)
[10]

QUESTION 10

LEVELLING THE PLAYING FIELDS

Tracy Pepper started 'Girlsport' in 2004 with the aim of coaching girls in football. Her long-term aim was to start a girls' football league in South Africa. When Tracy approached a major television sports channel offering her services as a football commentator, the broadcaster came up with numerous excuses for not featuring female football.

Is it not interesting that in 2014, Ros Howell, former South African Hockey coach, said: "Lack of funding impacts on the professionalism of women's sport ... World Cup victory comes down to infrastructure, money and unbiased governance of sport"?

[Adapted from *Fair Lady* magazine, October 2005]

Assuming unlimited funding, what is needed to advance the opportunities and performance outcomes for women athletes, across all sports in South Africa? Discuss.

(10)
[10]

QUESTION 11

Lisa is following in her parents' footsteps. Both her mother and father played professional tennis and she recently qualified to play at Wimbledon. Sharon, a sibling in a non-athletic family also qualified to play at Wimbledon.

11.1 Apply the **Nature vs Nurture** debate in sport to the above context placing emphasis on attraction to and success in the given sport.

(6)

11.2 In your opinion, which of these two forces/drivers accounts for athletic success? Motivate your response.

(4)

[10]

Total: 150 marks