



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2013

**SPORT AND EXERCISE SCIENCE: PAPER I**

**MARKING GUIDELINES**

Time: 2 hours

150 marks

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**These marking guidelines are prepared for use by examiners and sub-examiners, all of whom are required to attend a standardisation meeting to ensure that the guidelines are consistently interpreted and applied in the marking of candidates' scripts.**

**The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there may be different interpretations of the application of the marking guidelines.**

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**QUESTION 1**

- (a) (i) High GI foods cause a rapid rise in glucose levels followed by a rapid drop. Med GI foods also cause a spike but a more gradual one. Low GI foods remain pretty constant. (3)
- (ii) Blood glucose changes as a result of how easily a food is digested and how quickly it is absorbed. Spikes in blood glucose levels cause the sudden release of the hormone insulin. Rapid fluctuations in insulin levels are also thought to contribute to the hunger sometimes experienced two to three hours after a high-GI meal. However, low-GI meals cause carbohydrates to be released and absorbed gradually, thus avoiding spikes in glucose and insulin levels. (4)
- (iii) High GI foods are considered undesirable for athletes as they cause the blood glucose levels to spike rapidly resulting in an equally sharp insulin response. Athletes need to monitor their diets carefully, especially if they are involved in endurance sports. Foods with a low GI cause a slower, sustained release of glucose to the blood, whereas foods with a high GI cause a rapid, short-lived rise in blood glucose. Low GI foods could be useful in the pre-event meal as they would result in a slower and more sustained release of glucose during exercise maintaining blood glucose levels for a longer period. (5)
- (b) When an athlete is involved in a tournament it makes it much harder to replace carbs immediately and consistently for several hours.
- This means that they need to be drinking a carbohydrate rich energy drink.
  - Tournament directors or coaches should ensure that there are carb rich drinks readily available.
  - All athletes will need to 'experiment' with different drinks to see what suits them best, tastes the best, etc. so research and experimenting needs to be done long before a major tournament. An athlete should never try new foods for the first time during competition.
  - The athlete will also need to ensure that they consume the correct amount of carbohydrates so will need to be aware of how much they weigh and therefore need to consume.
  - As the carbs need to be consumed virtually as the activity ends, it would mean that the athlete needs to consume it while cooling down and stretching.
  - Adequate stocks will need to be brought to the tournament. (6)

(c)

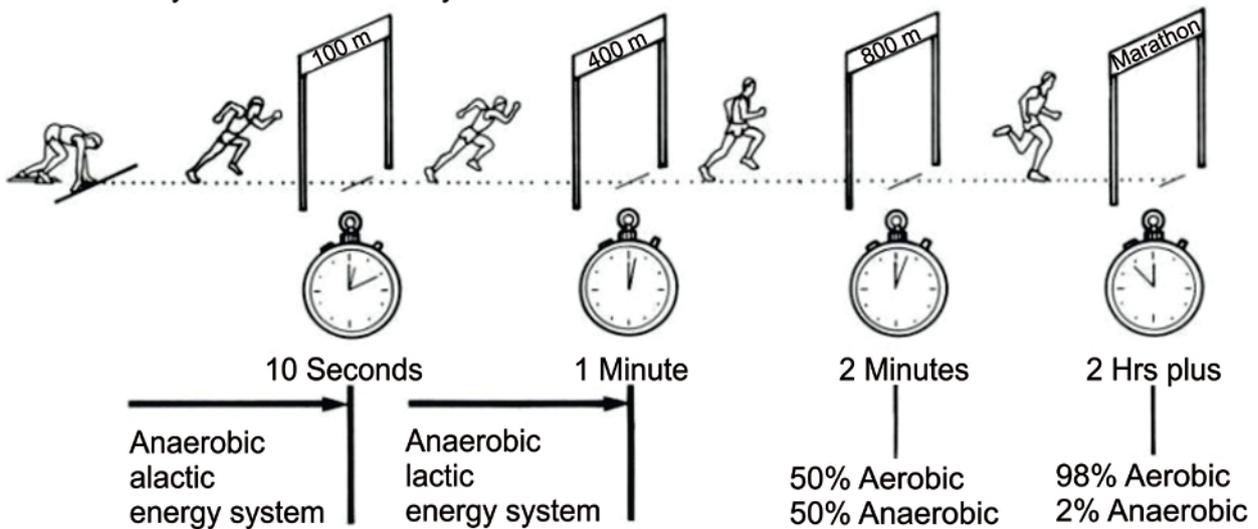
Energy System	Exercise intensity	Time of involvement	Sport type
Phosphagen system Alactic anaerobic system ATP/PC system	Intense	Less than 10 seconds	Short, fast sprints Weightlifting Jumping
Glycolysis Lactic acid system	Intense	43 – 60 seconds	400 m
Aerobic system	Moderate to easy	More than 2 hours	Marathon running

### Contribution of energy systems to time of movement

There are two important work times that mark a shift in emphasis from one of the three energy systems to another.

**10 seconds** – After 10 seconds of intense muscular activity the energy system providing the majority of the energy shifts from the anaerobic alactic to the anaerobic lactic system.

**1 minute** – After about 1 minute of intense activity the shift is away from the anaerobic lactic system to the aerobic system.



Energy system	Duration (sec)	Classification	Energy Source
ATP + CP	1 – 4	Anaerobic	Muscle ATP Stores
	4 – 20		Muscle ATP and CP Stores
Anaerobic Lactic Acid	20 – 40	Anaerobic	Muscle ATP, CP and Glycogen Stores
	40 – 120		Muscle Glycogen and Lactic Acid
Aerobic	120 – 2 400	Aerobic	Muscle Glycogen and Fatty Acids
	2 400 – 6 000		Muscle Glycogen and Fatty Acids

(12)

- (d) (i) personal opinions. Accept feasible answers. (1)
- (ii) Correct:  
World Health Organisation recommendation subscribes to 1 hour of physical activity per week per person to health protect against cardiovascular diseases in particular.
- Incorrect:  
Interpretation of balanced diet (RDA approved) does not take into account culture or economic or environmental bias in the equation of health protection. (1)
- (iii) Balanced nutrition and regular exercise have been found to contribute to well - being. Accept feasible answers. (2)
- (iv) This statement could limit people's thinking as it ignores other behaviours that contribute, e.g. positive thinking, psychology  
This statement also ignores finances, education, access to role models. Accept feasible answers. (2)
- [36]**

**QUESTION 2**

- (a) An athlete who is taking creatine will benefit from the physiological adaptations that occur. However, of even more importance is the psychological effects that could occur. The fact that an athlete believes that the substance enhances performance, will in fact influence them mentally and their belief that they are faster will make them faster.  
Answers must refer to psychological influence. (8)
- (b) There are several theories here – (learners to expand)
1. Creatine is a natural substance produced in the body and therefore shouldn't be banned. However, testosterone is also produced naturally and the taking of testosterone is banned. Any substance that is used in extreme amounts should be banned.
  2. All drugs should be banned.
  3. Supplements should be allowed and creatine should be considered a supplement.

(10)  
[18]

**QUESTION 3**

- (a)  $VO_2$  max – the maximum amount of oxygen utilised/equiv per unit of time/per minute  
Lactate threshold – the point at which lactic acid starts to accumulate in the blood/OBLA  
Lactate threshold is a percentage of  $VO_2$ max  
The higher the  $VO_2$  max, the more the delay in lactic acid build-up/as  $VO_2$ max increases, so does lactate threshold  
Trained athletes can exercise for longer periods at the same/higher intensity compared to an untrained athlete. (3)
- (b) Stroke perfection, technical accuracy in execution, training dose regulated – avoiding injury and over training. (2)
- (c)
- reduce the stresses on the body
  - prevent muscle soreness (DOMS)
  - allow muscles to relax
  - gradually decrease body temperature
  - reduce the chance of dizziness or fainting
  - stops blood pooling
  - gradually reduces adrenalin in the blood
  - stretches or lengthens the muscles
  - remove lactic acid (from muscles) or waste products
  - encourage blood flow to previously active muscles
  - breathing rate reduced
  - heart rate reduced
  - reduce carbon dioxide in the body/increase oxygen intake

(4)  
[9]

**QUESTION 4**

- (a) She is muscular and strong but she tries to set fashion trends – could encourage girls to play sport.  
 She shows good sportsmanship and is a role model. Encourage young tennis players to mimic her actions.  
 Her fashion sense on the court has made female tennis more popular with spectators and with the media – this means more money is going into female tennis. Bigger sponsors.  
 Decrease – could be that she is too muscular and some girls don't want to be so muscular.

ACCEPT OTHER FEASIBLE ANSWERS. (4)

(b)

SITUATIONS	Positive enablers (tick if this applies)	Negative barriers (tick if this applies)	Reason why this 'situation' is an enabler or barrier
Coaches with 'win at all costs' attitude		✓	Creates unsportsmanlike behaviour and possibly even cheating
Team mates providing encouragement	✓		This will make an athlete try harder More enjoyment Less pressure to perform
Coach giving positive criticism	✓		Allows athlete to make corrections to improve performance/skill
Coach ridiculing players for making mistakes		✓	Embarrassment May stop the athlete from continuing

(8)

- (c)
1. Health/fitness/maintaining body/weight (fat) loss.
  2. Stereotypical ideals of women's physique/body image promoted by the media/fashionable activity/role model/socially acceptable.
  3. Increased leisure time.
  4. More independence/have become less tied to home/housework/equal opportunities.
  5. Greater disposable income.
  6. Greater mobility/accessibility to transport.
  7. Improvement in levels of provision/more opportunities, including at home/clubs/sessions.
  8. Improvement in child care facilities/crèches/nurseries.
  9. School PE programmes promote healthy lifestyle/lifelong learning/provide opportunities for such activities.
  10. Positive discrimination to encourage women's participation/women only sessions/social activity.
  11. Sport is being promoted more among under-represented groups such as women.
  12. Indoor/non-competitive/non-contact.

(5)  
**[17]**

**QUESTION 5**

- (a) (i) Muscular power in legs. (1)
- (ii) Vertical jump; sergeant jump. (1)
- (iii) Plyometrics/weight; resistance training. (1)
- (iv) Fast twitch; white, type 2. (1)
- (v) Positional play, accuracy, goal scoring % per match, starting player every match, penetration skills plus other reasonable responses. (2)

(b)

Activity	Speed	Agility	Aerobic fitness	Power	Mental toughness	Co-ordination	Decision making	Team work	Muscular strength	Flexibility
Push Ups	1	0	2	4	5	2	1	0	5	1
Ladder Work/Agility	5	5	5	4	3	5	5	0	5	2
Group Spinning Class	5	3	5	3	4	3	1	4	4	2

Answers don't need to be exactly the same, some leeway allowed.

( $\frac{1}{2} \times 30 = 15$ )

- (c) A (ii)
- B (iv)
- C (vii)
- D (viii)
- E (vi)
- F (v)
- G (i)
- H (iii)

( $8 \times \frac{1}{2} = 4$ )

- (d) Untrained people may benefit from as little as 40% MHR training intensity while the highly trained may need to be exercising at near MHR to develop their cardiovascular system.

Age predicted MHR can vary based on gender, ethnicity, degree of training and genetics and so it might not be an accurate way to decide on training intensity.

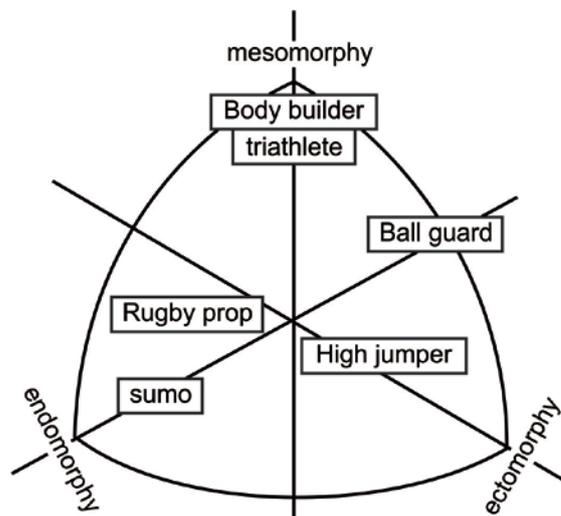
(6)  
[31]

**QUESTION 6**

- (a) Very little time is being spent active. This could be due to circumstances like lack of facilities, no sport offered at school, they have to work in the afternoons to bring more money into the household, no money to buy equipment. (2)
- (b) They are spending very little time involved in healthy activities – imbalanced. Most of their time is spent indoors, sedentary. (2)
- (c) Higher costs of living and the need to earn more money have increased pressure to study and work longer hours. People are busier and have less leisure time. Cultural groups will influence participation. A person with lots of money at their disposal will be able to experience a wide variety of activities as cost isn't a barrier. If a parent or sibling is active, this encourages other family members to be active. Very little opportunity – urban area, cars, pollution, no space to run freely, overcrowding. Matric pressure. (4)
- (d) (i) Children and adolescents should do 60 minutes (1 hour) or more of physical activity each day.(CDC) The Institute of Medicine recently released a lengthy report recommending that, as part of a routine regimen to maintain cardiovascular health and ideal body weight and body composition, we should all engage in 60 minutes of daily vigorous physical activity. (3)
- (ii) Schools would be required to monitor them by keeping registers for PE lessons and extramural sport. Pupils could carry a small book (issued by the school) if they exercise off the school property, e.g. a gym or a club. The gym instructor could sign the book and the number of hours that the pupil exercised for. Parents could become involved too. (3)

**[14]**

**QUESTION 7**



**[1/2 × 6 = 3]**

**QUESTION 8**

Allocate 1 mark for each activity if appropriate and specific.

Allocate another mark for the sequence of activities, i.e. Not similar activities following each other.

Allocate another mark for creativity.

**[10]**

**QUESTION 9**

- (a) (i) Accept appropriate answers. (2)
- (ii) Accept appropriate answers. (2)
- (iii) ALL FEASIBLE ANSWERS ACCEPTED. (2)
- (b) (i) Disease of the bones. Decrease in bone density. Leads to increased risk of fractures. (2)
- (ii) Eating a diet low in calcium and vitamin D. Lack of exercise, genetics, smoking, excessive alcohol. (2)
- (iii) Eat a healthy diet that includes calcium & vitamin D. Exercise. Don't drink alcohol or smoke. (2)

**[12]**

**Total: 150 marks**