



NATIONAL SENIOR CERTIFICATE EXAMINATION  
NOVEMBER 2013

**SPORTS AND EXERCISE SCIENCE: PAPER II**

**MARKING GUIDELINES**

Time: 2 hours

150 marks

---

**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.**

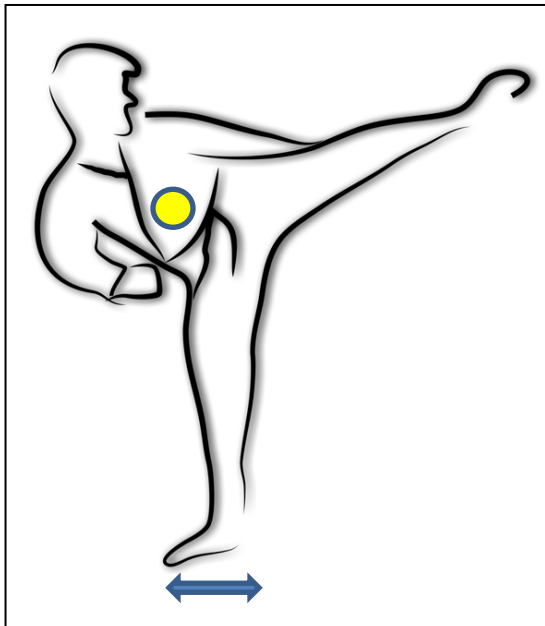
**The IEB will not enter into any discussions or correspondence about any marking guidelines. It is acknowledged that there may be different views about some matters of emphasis or detail in the guidelines. It is also recognised that, without the benefit of attendance at a standardisation meeting, there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

---

**QUESTION 1**

(a)

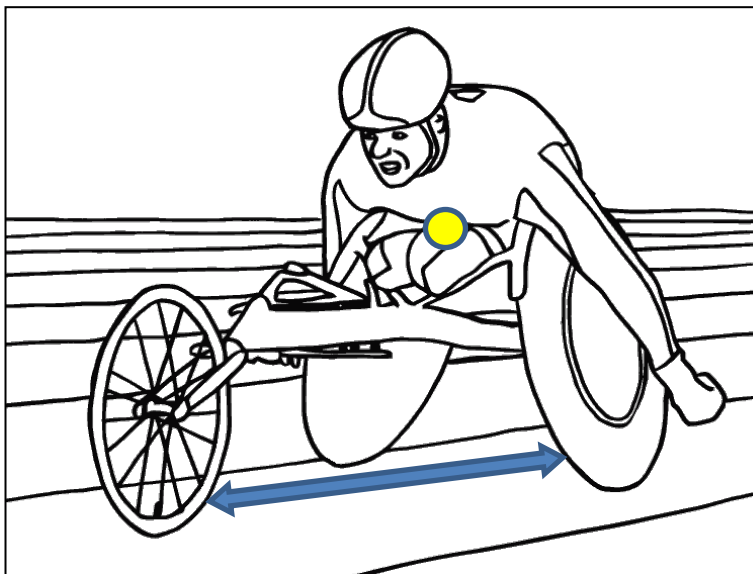
Picture A



Picture B



Picture C



(6)

- (b) (i) The base of support (BoS) for the martial art athlete in Picture A is short and narrow, which reduces/restricts stability. (1)
- (ii) The wheelchair athlete depicted in Picture C is **most** stable as the base of support is spread over a **wide area**. OR  
The wheelchair athlete is **most** stable as the base of support is spread over a **wide area and has 3 points of contact**. (1)
- (iii) A skydiver free-falling head-first at a rate of  $9,81 \text{ ms}^{-1}$  towards Earth, has their centre of gravity **in the middle of their abdomen**. (1)

[9]

**QUESTION 2**

- (a) (i) To improve stability and balance, body weight shifts towards the oncoming force. The line of gravity shifts towards the front edge of the base of support (toes). In other words, they lean forward. The ball carrier also needs to increase the base of support and lower the centre of gravity. (2)
- (ii) Ground reaction forces are used by the runner when their leg pushes into the ground and the ground pushes back with an equal and opposite force. This allows the body to propel forward. Increase ground reaction force. Move CoG forward. (2)
- (iii) Topspin is created by applying a horizontal force over the top of the ball away from its centre of gravity. This is achieved by angling the racket downwards over the ball. As the top half of the ball spins against the oncoming air flow, the ball dips down. (2)
- (iv) Degree of flexion of the knee of the take-off leg during the take-off phase. Lower CoG, increase stride. Allow momentum to swing into upward drive, using arms. (2)
- (v) A bowler generates force by running (vertical velocity) and turning the body sideways in order to rotate the trunk using the large muscles of the thighs, hips and torso. The combined forces are transferred sequentially through to the smallest muscles of the arm and hand to deliver the ball. (2)

**[10]****QUESTION 3**

- (a) 3 – has low moment of inertia because 75% of the weight is around the base. So the child can swing the racket more easily and use less effort to do so. A player using a longer racket will hit the ball with more force but it will take more effort and a longer time to swing the racket to meet the ball than when using a shorter racket. A shorter racket can be swung faster and more easily, but generates less force to hit the ball. Light weight, easier for the child. (4)
- (b) 1 – high moment of inertia as weight is around the head of the racket. This increases skill accuracy and reduces chance of injury when the hand rotates (if the ball is struck off centre – player is a beginner so likely to happen). (3)
- (c) the longest racket – 74 cm. Powerful control racquet generally 280 – 300 g. the long racket has further distance to travel in which to accelerate and generate more speed and momentum. (3)
- (d) Move grip down the handle. Shorten the grip. This causes moment of inertia to decrease as it shortens the distance between the axis of rotation and the racket's centre of gravity. (1)
- (e) Strength and technique of the player. Size of force generated through muscle size and summation of force between muscle directly affects the speed with which a racket can be swung towards the ball. (2)

**[13]**

**QUESTION 4**

<b>Example</b>	<b>Class of Lever</b>	<b>Motivation</b>
Leg press	1 <sup>st</sup> class (1)	Load-fulcrum-effort Load = Weights Fulcrum = Pulley on machine Effort = Legs pushing (3)
Bicep curl	3 <sup>rd</sup> class (1)	Fulcrum-effort-load Fulcrum = joint Effort = bicep muscle Load = dumbbell/weight (3)
Calf raises	2 <sup>nd</sup> class (1)	Fulcrum-load-effort Fulcrum = toes Load = body Effort = calf muscles (3)

**[12]****QUESTION 5**

<b>Phases</b>	<b>Technical requirements for each stage of the phase</b>
Preparation	Stance – front on, allowing leg to swing. Vision. (1)
	Non-kicking leg – planted next to the ball, providing a platform for the kicking leg to swing through. (2)
	Backswing – kicking leg is bent. This creates a short lever to swing at speed. Leg is extended behind the body allowing a large range of motion and force to be used. (2)
Action of kicking	Body weight – this gets transferred forwards towards the direction of the kick. (1)
	Forward swing – kicking leg swings through, underneath the ball. (1)
	Strike – kicking foot contacts the ball on the inside of the foot. (1)
Follow Through	Leg is drawn forwards and upwards in the direction of the kick. This allows power and accuracy. (2)

**[10]**

**QUESTION 6**

(a) The answer should include the following:

Leadership involves

- Someone who remains focused and clear-thinking even under pressure
- Has trust and respect of players and management
- Person you can turn to for help and advice
- Someone who is prepared to voice their opinion when needed
- Ability to get ideas and concepts over clearly
- Inspire others through actions and words
- Good organisational skills
- Has experience
- Fair and honest
- Not afraid to make unpopular decisions for the good of the team
- Has a clear idea of where the team is going and how to get there
- Able to relate well to individuals and groups in a range of situations
- Able to criticise constructively when necessary
- Able to make decisions in games
- Mediate disputes between rival players on the field
- Liaise with referee
- Deliver pre-game talk, motivate

Learners must refer to leadership styles and communication skills.

(10)

(b) • Leader's character and personality

- Leader's upbringing
- Social environment
- Political environment
- Time available
- Whether task-oriented or people-oriented
- How imminent, pressured or dangerous the situation is
- Previous styles of leadership experienced and their successes/failures

(5)

(c) • Teambuilding workshops

- Improve communication
- Conflict resolution
- Education
- Socialising
- Other feasible answers

(5)

(d) Get them to meet on a regular basis before the planned activity.

Do several group-based activities beforehand.

Establish lines of communication and leadership

Get the group to agree to the key objectives of the outing/activity

ACCEPT OTHER FEASIBLE ANSWERS

(3)

**[23]**

**QUESTION 7**

(a)

<i>Warm up</i>	Increase in muscle temperature and flexibility to prevent tears and strains of muscles. (1)
<i>Drink up</i>	Decreases chance of dehydration or heat exhaustion which can lead to reduced blood volume and constricted blood flow leading to fatigue. (1)
<i>Gear up</i>	Protective gear is worn when playing contact sports. Could wear hat to prevent sunburn. (1)

(b)

- (i)
- Ride to school day
  - Get cycling celebrities to visit
  - Provide bicycle education
  - Encourage parents to ride with their children
  - Advocate cycle paths (2)

(ii)

<b>Agencies</b>	<b>Action</b>
The town council/ municipality	Set slower speed limits near schools Create more bike paths Make helmets compulsory Have the police do a blitz in school areas re cars speeding (3)
The local traffic police	Monitor speeds in school areas Demarcate cycle lanes in the mornings and afternoons AND monitor them (3)
The school	Offer bike education Get the teachers to cycle too Provide secure parking for bikes Offer incentives/prizes for most consistent rider Have safety personnel at school entrance to stop cars and allow cyclists through (4)

**OTHER FEASIBLE ANSWERS ACCEPTED**

(c) (i) Drowning, hyperthermia, concussion, broken bones, people falling overboard, people separated from the craft. (3)

(ii) **Risk reduction strategies**

- Limit the number allowed on a raft
- Check raft for leaks, etc.
- Ensure all can swim
- Ensure all are taught river survival
- Ensure lifejackets are worn and fit properly
- Rafters to wear helmets
- Include bailers/buckets in the raft to remove water
- All rafts to be fitted with safety equipment
- Brief participants on bracing techniques
- Check the river for hazards
- River course selected to suit level of participants
- Leader must familiarise themselves on weather conditions and river levels.
- Check weather forecast

Rendezvous point and emergency evacuation point clearly identified

Have off-river support on hand

Leaders trained and briefed on safety and emergency procedures

River checked for potential hazards beforehand, e.g. rock slides, overhanging branches

Activity has clearly established guidelines regarding appropriate behaviour and emergency procedures

Participants trained in emergency procedures

(4)

**[22]**

**QUESTION 8**

(a) (i) Hamstring curls. Accept feasible answers. (1)

(ii) Any hamstring stretch but must be non-ballistic. (1)

(b) (i) Isotonic concentric. (1)

(ii) The z lines move closer together

The I band reduces in width

The H zone may disappear

Myosin cross bridges attach to actin filaments and pull the actin in towards the centre.

(5)

**[8]**

**QUESTION 9****Newton's 1<sup>st</sup> law of motion**

Newton's First Law states that an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force

The rugby ball will not move until it is kicked or thrown. It will continue moving in the direction it was kicked or thrown until another person catches it or until it hits an upright, etc.

A runner will continue moving until he gets tackled.

ACCEPT SIMILAR EXPLANATIONS – must refer to rugby or judo. (4)

**Newton's 2<sup>nd</sup> law of motion**

Acceleration is produced when a force acts on a mass. The greater the mass (of the object being accelerated) the greater the amount of force needed (to accelerate the object).

The larger the player the harder it is for him to accelerate and the harder it is to stop him.

ACCEPT SIMILAR EXPLANATIONS – must refer to rugby or judo. (4)

**Newton's 3<sup>rd</sup> law of motion**

For every action there is an equal and opposite re-action.

The harder the player pushed off the floor, the greater the reaction force off the ground.

The harder someone is tackled, the harder the rebound off him.

ACCEPT SIMILAR EXPLANATIONS – must refer to rugby or judo. (4)

**[12]**



**QUESTION 10**

- (a) On arrival at the airport, both groups demonstrate similar RHR. Both groups' HR increase as they get into their jump gear – this is due to anticipatory rise where a person's HR increases prior to exercise. As the jumpers climb into the aircraft their pulse rates increase rapidly. The experienced jumpers more so as they are excited and adrenaline is being pumped around the body. The novice jumper's HR increase rapidly as the plane warms up – this is due to nerves. Their HR continues to increase until there is a massive spike just before exiting the plane.

The experienced jumpers HR, however, increases until they are airborne. Then it stabilises. Before exiting the plane, their HR has dropped. This indicates that experienced jumpers get more excited when getting into jump gear than when actually jumping. (8)

- (b) This is a close link between motivation and arousal. Arousal is linked to the state that drives a person to learn or perform.

Arousal is a general mixture of the physiological and psychological levels of activity that a performer experiences.

Arousal is not to be seen as good or bad but rather represents the level of energy or effort that a person applies to any sporting or learning situation.

When the body is placed under physical or mental stress, it produces levels of arousal which affect the information processing and then performance. If the activity needs lots of decision making quickly and accurately then the effects of arousal will be more noticeable.

If the body is placed under stress, physically or mentally, then arousal levels are increased and we are motivated to behave in a way that will reduce these levels to the optimum (perfect) level of arousal.

Physiological reactions to increased arousal levels:-

- Heart rate
- Blood pressure
- Skin responses
- Biomechanical indicators like adrenaline and epinephrine

An athlete preparing for a big physical race needs to be in a highly alert state/ arousal. The body must make sure that it can meet all the physiological demands → muscles need blood sugars, oxygen, etc.

Sport involving high intense exercise like soccer or netball, are associated with a highly aroused state



Lots of adrenaline  
Increased heart rate  
Increased breathing rate

This aroused state is often associated with emotional states of fear, anger, tension, worry, apprehension and anxiety.

Research has shown that levels of arousal can affect levels of perception, attention and movement control. A performer needs to have **appropriate** levels of arousal in order to promote effective concentration, attention and decision-making levels to produce optimum performance. Coaches know that to be 'psyched up'. The intensity of arousal levels is often an important factor in competition. If arousal gets too high, the athlete can become anxious. If it is too low, they may become bored and demotivated.

Both states can have a negative effect on performance.

Research shows that motor skills (skills that are physical and need muscle control, e.g. dribbling) generally need an above average level of arousal. If the skills or activity use mainly gross movements (use large muscles, e.g. walk, kick, run) and simple skills (e.g. swimming) using strength, endurance and speed and little decision making then higher levels of arousal will be more effective.

Activities involving very fine, accurate muscle actions or complex tasks needing higher levels of perception, decision making, concentration and attention, will be more effective if the arousal level is lower.

(10)

- (c) Small amounts of stress is good as it helps you concentrate on situations that require attention. Major stress over a prolonged period can be detrimental to your well-being and can cause symptoms like headaches, anxiety and depression. It's important to identify what causes stress and develop strategies to overcome them. Perceptual narrowing can get so bad from extreme levels of arousal that it can hinder the smooth control of physical movement. This is also called 'blind panic'. So when teaching beginners it's better to get their arousal levels low, by avoiding audiences and competition.

(6)

**[24]**

## QUESTION 11

- (a)
- Keep the head down
  - Squeeze the ears between the arms
  - Point toes
  - Legs straight
  - Kick faster so that the legs don't drop so much
- (3)
- (b) (i) Swimmer catches 'clean' water.  
As much movement as possible is gained by each stroke. (2)
- (ii) Reduces turbulence that slows the swimmer.  
Reduces drag forces. Hand should be almost parallel as it enters the water to push the body. (2)

**[7]****Total: 150 marks**