NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2017

SPORT AND EXERCISE SCIENCE

MARKING GUIDELINES

Time: 3 hours 300 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.

SECTION A

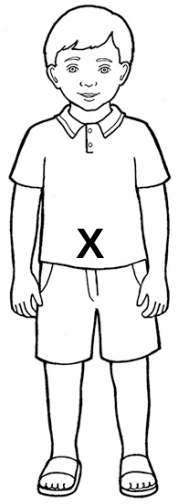
QUESTION 1

1.1	D
1.2	C
1.3	A
1.4	H
1.5	B
1.6	E
1.7	G
1.8	F

QUESTION 2

Allocate 2 marks per picture.

Picture A

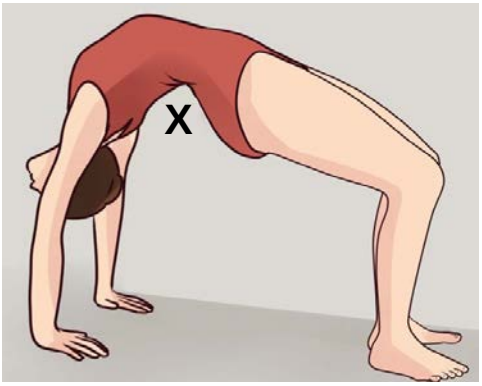


(Cross at bellybutton height & central)

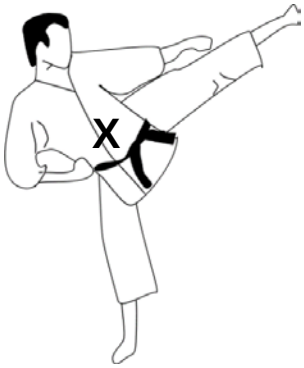
Picture B

(Cross at bellybutton height & slightly off centre)

Picture C



Picture D



(Cross at bellybutton height & off-centre)

Picture E

(Cross closer to head than to bellybutton and central)

QUESTION 3

	ENERGY SYSTEMS		
	ATP/PC System	**Lactic Acid System**	**Aerobic System**
Tennis serve	X		
Golf swing	X		
5 000 m run			X
High jump	X		
800 m run		X	

QUESTION 4

Columns 3 and 4 must correlate.
High school hours should be the most.

Phase of life	Type TWO examples of activity participating in	Approximate time per week spent participating	Provide ONE reason for the amount of time spent participating
Primary school 8–12 years old	Skipping. Gymnastics. Athletics. Swimming. Accept feasible. Or skill related to sport	4 hours or more	Allocate 2 marks for 1 reason: They don't have as much academic pressure as older children. Parents enroll them in lots of sports. School sport is compulsory. They have lots of energy. Accept feasible. To get fit Develop coordination
High school 13–18 years old	School sports like hockey, netball, rugby, swimming. Accept feasible.	3 hours (or close to this figure). 3–6 hours	Allocate 2 marks for 1 reason: School sport might be compulsory. Academic and cultural activities take up time.
University and tertiary education 19–24 years old	Varsity sports like rugby or netball. Gym. Accept feasible.	(This must be less than previous two). 4–5 hours	Allocate 2 marks for 1 reason: Studies take up most of time. As well as socializing. No parents or teachers forcing them to participate.
Career and marriage	Gym. Social club sport. Accept feasible.	1 hour. 1–3 hours	Allocate 2 marks for 1 reason: Too busy raising children. Driving children to sport. Watching children play sport. Settling in to career.
Old age	Bowls. Cycle. Social tennis. Accept feasible. Golf Swim Pilates Not rugby or squash	2 or 3 hours. This could go either way – fewer hours because old and sore. More hours because retired and have more time. The last 2 columns need to correlate. If they select 'golf' then this time will be longer.	Allocate 2 marks for 1 reason: Retired so have more time **OR** They are too old to participate.

QUESTION 5

5.1 Hips or knees

5.2 Shoulder

5.3 Base of vaulting pole or hips

5.4 Shoulder

QUESTION 6

Sport	Type of protective clothing	Reason for using the protective clothing
Cricket batsman	Allocate 1 mark for any one of the following: • Helmet • Body padding • Box • Gloves	Allocate 2 marks for correct reason, e.g. helmet to prevent being struck on the head or in the face. Accept feasible.
Hockey player	• Shin pads • Gum guard • Gloves • Face mask at short corners • Goalie – all their padding	Allocate 2 marks for correct reason, e.g. gum guard to prevent facial injury or teeth being knocked out should a ball or stick strike. Accept feasible.
Waterpolo player	Cap with ear protectors. Tight-fitting costume Don't accept goggles	Allocate 2 marks for correct reason. To protect the ears from being struck by opponent. Costume – so not grabbed or scratched under water Accept feasible.
Formula 1 motor racing driver	• Neck brace • Fire retardant clothing • Knee pads • Helmet • Gloves	Allocate 2 marks for correct reason, e.g. neck brace to hold head upright when cornering – to withstand G forces. Accept feasible.

SECTION B

QUESTION 7

7.1 57 ml/kg/min.

7.2 He uses 57 ml of oxygen per kg of his body weight per minute.
(VO_{2max} is measured in terms of millilitres of O_2 used per kg of body weight.)

7.3 It was designed to collect/gather all the air/gases that he exhaled.

7.4 Allocate 1 mark per point:
- Every runner had a certain critical speed.
- When they were running below that speed they could get enough oxygen to fuel their efforts.
- But when they had to run faster, the body wasn't able to process enough oxygen. Use Anaerobic system.
- Lactic acid builds up, causing fatigue.

7.5 Lactic acid or lactate.

7.6 Allocate 1 mark for any four of the following:
- Performance declines.
- Peak performance is only achieved after long rest and recovery.
- Athlete needs longer recovery time after training and competition.
- Performance is affected by injury and pains during training and competition.
- Recurring injuries.
- Muscle fatigue and weakness – shrinking muscle mass.
- Change in heart rates.
- Unintended weight loss.
- Low immune system.
- Lowered anaerobic and lactate thresholds.
- Muscle pain and joint ache.
- Tight shoulders and neck that can lead to a tight torso, tight jaw, tightness in the arms and hands and eventually tightness into the legs and ankles.
- Low self-esteem and loss of confidence.
- Irritable, angry and aggressive. Irrational.
- Loss of interest.
- Lack of concentration.
- Poor coordination.

7.7 Allocate 1 mark for any of the following:
Lactic Acid system **OR** Glycolytic energy system **OR** Anaerobic energy system.

7.8 Allocate 1 mark for any three of the following:
- Slow down or find critical pace
- Walk
- Stop
- Take deep breaths/control breathing
- Alternate between slow and fast walking

7.9 Allocate 1 mark for either of the following:
Aerobic system or Oxidative system.

7.10 Allocate 1 mark for any of the following:
- ATP – PC system
- ATP – CP system
- Alactic system
- ATP – PCr system
- Lactic Acid system

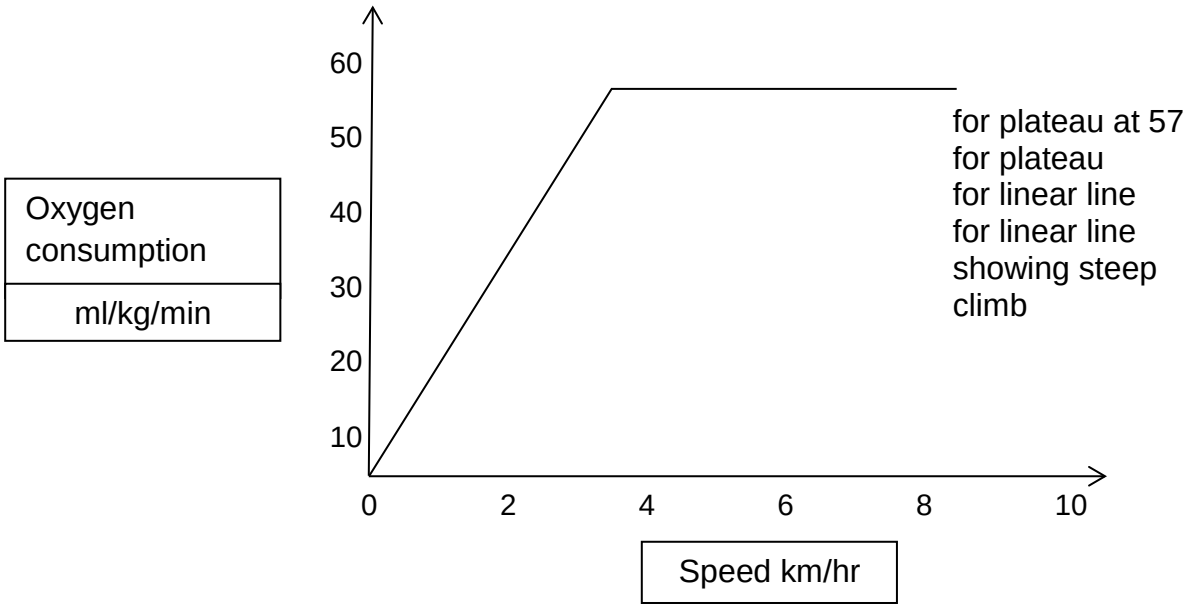
7.11 Allocate 3 marks per factor – 1 mark for stating the factor, 2 marks for explaining the impact on performance. Pupils to provide 2 factors.
Pupils may use different wording as long as the gist is the same.
Accept any 2 of the following:
Factor: Being mentally strong **OR** use of psychology.
Example of Explanation: An athlete who believes in themselves or who uses psychology like visualisation is able to block out distractions and focus on what is relevant.
Factor: Better training.
Example of Explanation: Correct training that includes rest and periodization will ensure that the athlete is physically at optimum.
Factor: Use of sports science technology.
Example of Explanation: Using items like heart rate monitors or cooling vests for example will ensure that the athlete is at peak condition.
Factor: Nutrition, including hydration.
Example of Explanation: Correct diet ensures energy systems can provide ATP for performance.
Factor: Better equipment.
Example of Explanation: Using state of the art equipment will ensure ease of performance and improve results, e.g. light, streamlined canoes, light clothing for endurance athletes.
Factor: Physiological factors
Example of Explanation: cardiovascular and respiratory systems able to deliver oxygen and nutrients quicker and remove waste quicker
Factor: Discipline or motivated
Example of Explanation: being motivated and disciplined means that the athlete is prepared to train harder and longer
Accept feasible.

7.12 **Example of answer:** As you increase the intensity of your exercise there is a point where blood lactate begins to accumulate/gather above the levels found when at rest. The removal of lactate can't keep up with the production of lactate.

7.13 **Central Governor** Theory – all activity is controlled by the brain to ensure that nothing in our body is pushed beyond the normal range.

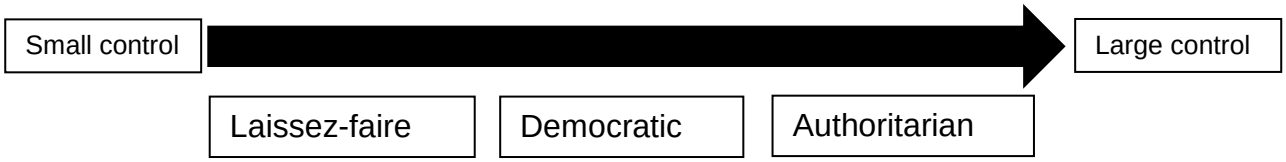
Fatigue – fatigue is an emotion, a construct in the mind that helps ensure that exercise is performed within the body's ability.

7.14 **TITLE:** Two variables must be provided.
For example: Oxygen update during exercise/running.
Speed and VO2max
Answer must state 'relationship' or 'comparison' or 'it's a line graph'
(Accept feasible)



QUESTION 8

8.1



8.2 Allocate 1 mark for providing the skill.
Allocate 1 mark for providing a reason why the skill is needed.

Possible responses:

- **Skill:** Communication skills.
  Reason: Leader needs to give instructions that are clear and understood.
- **Skill:** Conflict resolution.
  Reason: Has to deal with different personalities in the team.
- **Skill:** Listening skills.
  Reason: Needs to hear and understand what players are saying.
- **Skill:** Enthusiasm.
  Reason: Need to keep the team motivated.
- **Skill:** Sports knowledge.
  Reason: Needs to know the rules and tactics to impart them.
- **Skill:** Motivation/Positivity.
- **Skill:** Vision
- **Skill:** Discipline
  Accept feasible answers.

QUESTION 9

9.1 Allocate 2 marks for a feasible answer, e.g.:
- Contracted muscle
- Sliding filament

9.2 (a) D

(b) A

(c) G

(d) F

(e) B and C

(f) E

9.3 When a muscle contracts the actin (F) & myosin (G) filaments slide over each other as shown in Picture 2.
The actin filaments are attached to the Z lines (B & C) & when a muscle contracts the 2 Z lines get pulled closer together & this shortens the sarcomere (E).
If no letters used then candidate gets maximum 5 marks.

QUESTION 10

10.1 Her average reaction time is poor or slow.

10.2 When given a large time to react, i.e. when the ball is served at a slower speed (20 km/hr), the performance is better (return 9 out of 10) **OR** performance decreases as the speed of the ball increases **OR** when the ball is served at a fast speed, the performance level drops.
Must refer to data.

10.3 Anticipation allows athletes to predict where the ball is going **OR** it allows the athlete to prepare. Boosts performance.
Accept reference to Anticipatory rise.

10.4 (a) Allocate 1 mark for any three of the following:
- Previous experience.
- Knowing the opponent.
- Audience.
- Skill level.
- Fatigue.
- Eye tracking.
- Eye-hand coordination.
- Concentration.
- Stress.
- Fitness level.
- Eye sight.
- Very cold weather.
  Accept feasible.

(b) Allocate 1 mark for any three of the following explanations:
- Previous experience – the athlete will know what to expect, creates less anxiety.
- Knowing the opponent – where they normally serve to; their strengths and weaknesses.
- Audience – crowd size – big crowd causes anxiety, boyfriend watching also causes anxiety.
  Accept feasible.

QUESTION 11

11.1 Simple

11.2 Allocate 1 mark if provide an appropriate sport, e.g. swimming, sprinting, soccer, netball. Allocate another mark if more specific, e.g. soccer goalkeeper. Accept feasible.

11.3 Allocate 3 marks for each task.
Athlete A is involved in a complex task requiring concentration – many sub-routines which must be performed in the correct sequence & at the right time **OR** they need to be aroused enough to perform well but not too aroused so that they lose focus.
Athlete B is involved in a simple task requiring a fairly high level of aggression. They need to psych themselves up to a higher level in order to perform well.

QUESTION 12

12.1 1 hour
If candidate states 45 minutes to 1 hour then allocate 1 mark only.

12.2 Allocate 2 marks per trend. Pupils to provide 3 trends.
1 mark for identifying a trend and 1 mark for explanation.
- **Trend:** More males than females participate in sport.
  Explanation: Females often have to care for family and the household.
- **Trend:** More males in the 15–18 age category participate than males in the 19–25 age group.
  Explanation: Numbers decline once boys leave school and they move into the workplace or tertiary education.
- **Trend:** More females in the 15–18 age category participate than females in the 19–25 age group.
  Explanation: Numbers decline once girls leave school and they move into the workplace or tertiary education.
- **Trend:** In 2010 the numbers participating increased slightly.
  Explanation: SA hosted the soccer World Cup.
- **Trend:** The drop off rate for females is much higher than in males.
  Explanation: Females are often forced to become the caregivers and therefore have no time for leisure activities.
  Accept feasible responses.

- **Trend:** Declining numbers.
  Explanation: Obesity.

QUESTION 13

13.1 Graph A

13.2 Marks allocated to any 8 of the following points or similar:

- Over time the athlete's performance is dropping even though they are training/placed under stress.
- Performance declines/drops even though training has continued
- Training or exercise causes physical stress on the muscle/body
- Muscle fibres tear (microscopic tears)/breakdown
- This stress causes performance to decline
- After short rest, an athlete will recover slightly, i.e. partial recovery
- If there is no rest or if the rest is too short their performance will continue to decline
- If the training is too intense/muscles overloaded too much then performance will decline
- Athlete's performance will progressively get worse
- Athlete's fitness levels will drop
- Overtraining which is training with little or no rest, results in performance decline.

Example of possible response:
The athlete's performance has gradually declined as training has progressed/continued.
When an athlete is placed under stress when training or exercising, the muscle fibres undergo microscopic tears and they will suffer a drop in performance.
After a short rest, they will recover slightly.
However, if the athlete does not rest for long enough or if their training is too intense (overload is too great) then they will progressively get worse and worse – performance will decrease.

13.3 The athlete was well rested between training sessions.
The training overload was done gradually and progressively.

13.4 When the athlete was given enough rest (24–36 hours) it allowed the body to repair itself and adapt to increased stress to cope with increasing load.

13.5 Pupils to provide three suggestions. Allocate 1 mark per suggestion.
Possible responses:

- Ensure that workouts aren't too long.
- Ensure that workouts aren't too intense.
- Ensure that workouts aren't too frequent.
- Use periodisation.
- Programming recovery training and rest days into the training cycle.
  Accept feasible response.
  Monitoring athlete.

QUESTION 14

14.1 If the pupil explains levers without using the pictures then they can only earn a maximum of 6 marks.
Marks allocated to any 10 of the following points or similar:

- A lever provides strength.
- The greater the distance between the joint and the effort, the more strength/force can be generated.
- Longer levers create greater speed and force at the end of the lever arm which is an advantage when hitting/striking a ball.
- A tennis racket in a player's hand creates a longer lever.
- Long levers create more force on the tennis ball.
- Long levers create more speed/velocity generated on the tennis ball.
- A tennis ball can be hit harder when the elbow joint is fully extended rather than flexed as seen in picture F.
- The length of the lever allows the racket head to travel at full speed.
- In picture F the elbow extends to increase the length of the lever, this allows the ball to leave the racket head with more speed.
- The player needs to shorten the lever arm so that when the arm straightens the lever lengthens and this creates more force (picture C).
- By bending the elbow it shortens the lever arm length, and this creates more force or the racket swung with more speed.
- A player will shorten the lever arm length by bending their elbow, allowing force to be generated and the racket swung with more speed (picture C).
- As the ball is hit, the elbow extends to increase the length of the lever and allow the racket head to travel at full speed (picture D).
- Another way to maximise lever length is by increasing the distance of the point of application of the force from the fulcrum, as this can increase the force.
- A player wants the impact zone to be further away from the fulcrum, e.g. a racquet in her hand increases the lever length which causes greater acceleration of the ball away from the racquet head.
- Pictures G & H – shortens lever in the follow-through – this increases accuracy of the shot.

14.2 Award 2 marks per answer.

(a) Fulcrum – shoulder joint

(b) Force – deltoid. Pectorals; Lattisimus dorsi.
If pupil answers 'trapezius' then allocate 1 mark only.

(c) Resistance – racket head

14.3 Allocate 2 marks for the definition or explanation of each law.
Allocate 2 marks for applying the law to a tennis serve.

1st Law – 'a body continues at a state of rest or uniform velocity unless acted upon by an external force' **OR** 'an object will remain at rest or in uniform motion in a straight line unless acted upon by an external force.'

Application of Law – if the player doesn't apply force through the hand to throw the ball into the air, it will remain at rest on the hand **OR** the muscles swinging the racket overcome the inertia of the racket. Accept feasible.

2nd Law – 'when a force acts on an object, the rate of change of momentum experienced by the object is proportional to the size of the force and takes place in the direction in which the force acts.'

Application if Law – When the racket makes contact with the ball, it causes the ball to accelerate in the direction it was hit **OR** the amount of acceleration depends on the amount of force exerted on it **OR** the ball will continue to move forward until acted upon by an external force either gravity or the contact with the opponent's racket. Accept feasible.

3rd Law – 'for every action there is an equal and opposite reaction.'

Application of Law – the racket hitting the ball is the action, the reaction is the ball pushing on the racket bending strings. Accept feasible.

QUESTION 15

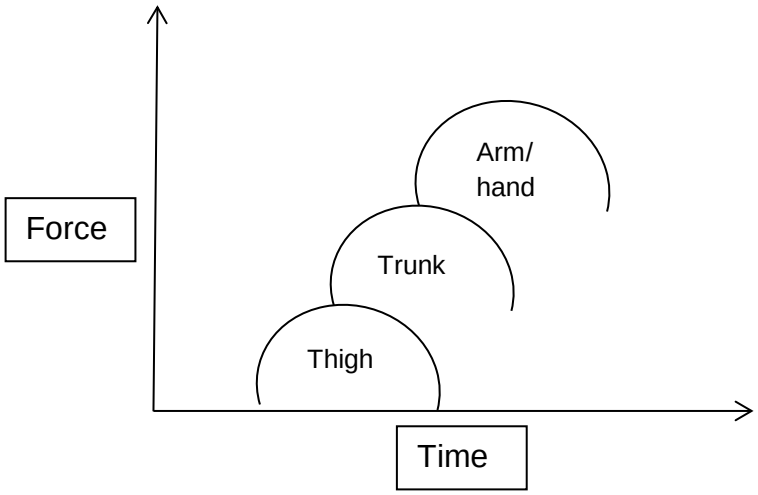
15.1 Player B

15.2 Player A is lighter **OR** has less inertia or less momentum.
Player A is easier to tackle.

Player B is heavier/has more mass **OR** has more momentum.
Player B will easily tackle the lighter player A **OR** the lighter player will struggle to tackle the heavier player.

15.3 The athlete is not transferring force correctly between body segments.
The trunk movement is taking place too soon after the thigh movement.
The arm movement is taking place too late or is delayed after the trunk movement.

15.4



Allocate 1 mark for each segment being perfectly placed (the line must touch the middle of the semi-circle below it). (2 marks)
Allocate 1 mark for each segment being in the correct order. (3 marks)
Allocate 1 mark for all the semi circles being the same size.

QUESTION 16

16.1 Allocate 2 marks for either of the following responses:
Snow
Ice

16.2 Allocate 2 marks for any one of the answers below:
- Rub wax underneath.
- Polish the underneath of the board.
- Ensure that the board is absolutely smooth, no rough edges.

16.3 By not carving, the athlete is not digging the board into the snow and causing a bigger surface area to cut the snow.

16.4 (a) Allocate 2 marks per response.
Accept any three of the following:
- Stand with feet wide apart **OR** wide base of support.
- Bend the knees **OR** lower the body.
- Lean in the direction of movement.
- Keep line of gravity within the base of support.
- Spread arms out.

(b) Accept any three of the following:

- Stand with feet wide apart **OR** wide base of support – standing with feet apart widens the base of support. The bigger the base of support, the more stable a person is and the harder it is to fall over.
- Bend the knees **OR** lower the body – this lowers the centre of gravity and makes the athlete more stable.
- Lean in the direction of movement – this gives the athlete more control which in turn makes them more stable.
- Keep line of gravity within the base of support – this keeps the athletes weight over the board and makes them more balanced/ stable.
- Arms out spreads the body weight.

16.5 In order to change direction quickly the snowboarder would need to keep shifting body weight and leaning into the corners **OR** the athlete would 'dig' the edge (carves) of the board into the snow to create friction and 'turn' the board.

16.6 A snowboarder digs the edge of the board into the snow to stop **OR** a snowboarder digs (carves) the board into the snow and leans backwards to stop whereas an ice skater turns their skate 90 degrees to scrape the ice and stop. Snowboarder could use one hand to 'catch' the snow behind the board to slow down.

QUESTION 17

ESSAY RUBRIC

	1 mark	2 marks	3 marks	4 marks	Possible mark (20)
Use of knowledge from sources	Reference made to one source only.	Reference made to 2 sources only.	Several and appropriate references made to all sources.	Source detail very close to full potential used to support argument.	4
Quality of argument decision	Writing consists of facts with little linkage or reasoning.	Reasoning correct but hard to follow. Some linkage evident.	Supports the position. Reasoning is clear. Minor errors in flow. Linkage is sometimes missed.	Strongly supports a clear position. Reasoning is very clear and succinct. Flow is logical. Compelling with regular linkage. Well integrated argument.	4
Use of real-life examples	Vague reference to examples but no integration.	Examples are given but most are not clear and specific nor integrated into the argument.	Several specific examples are given but not well integrated into the argument **OR** One or two specific examples are given that are well integrated into the argument.	Several specific examples are given **AND** well integrated into argument.	4
Use of own knowledge × 2	Some relevant facts given beyond the sources to support argument.	Some relevant facts given beyond the sources to support argument **AND** integrated into the argument.	Many relevant facts given beyond the sources to support argument.	Many relevant facts given beyond the sources to support argument **AND** integrated into the argument.	8

Some possible factors that could be used in the argument:

- Differing prize money, e.g. Duzi canoe marathon males win more.
- Lack of media exposure – TV, magazine, newspapers.
- Female sports like netball very seldom seen on TV. Never seen female hockey but do see male hockey.
- Media commentary is sexualised. Female's clothing and looks often referred to rather than their skill and talent.
- Sponsorship opportunities – females struggle for sponsors.
- Females are sexualised in adverts whereas men aren't.
- Less opportunities for females, e.g. formula 1 motor racing.
- Females are not allowed at certain clubs, e.g. Lords.
- Stereotypes of females being a weaker sex – 'throw like a girl'.
- More sexual harassment of females in elite sport.
- Female playing kit often designed to look sexy, e.g. volleyball where females wear small bikinis but males wear baggy shorts and vest.
- Barriers to female success, e.g. limited access to competitions and clubs.

Total: 300 marks