NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2017

SPORT AND EXERCISE SCIENCE

EXAMINATION NUMBER

Time: 3 hours 300 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 29 pages. Please check that your question paper is complete.
2. Read the questions carefully.
3. Use the total marks awarded for each question as an indication of the detail required.
4. It is in your own interest to write legibly and to present your work neatly.

FOR MARKER'S USE ONLY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	**Total**
Marks	16	10	5	25	4	12	55	11	23	12	10	8	19	28	16	26	20	**300**
Obtained																		

SECTION A

QUESTION 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	Vasoconstriction	A	Accumulation of more than 20% of body fat above the norm.
1.2	Tennis elbow	B	Caused by tearing of muscle along shinbone.
1.3	Obesity	C	Caused by using forearm muscles too much.
1.4	Somatic techniques of controlling aggression	D	The blood vessels narrow and this reduces blood flow.
1.5	Shin splints	E	Slow release carbohydrate.
1.6	Low GI food	F	The increase in the internal diameter of blood vessels.
1.7	Delayed Onset Muscle Soreness (DOMs)	G	Muscles feel sore 2 days after exercise.
1.8	Vasodilation	H	Involves physiological strategies.

ANSWERS:

1.1	
1.2	
1.3	
1.4	
1.5	
1.6	
1.7	
1.8	

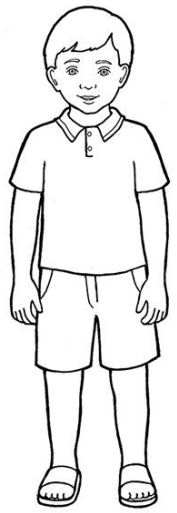
[16]

QUESTION 2

Indicate clearly with an 'X' where the **Centre of Gravity** would be found in the following pictures.

Ensure that the 'X' is clearly visible to the marker.

Picture A



[<https://clipartfest.com/b21f1bc30d8ac.html>]

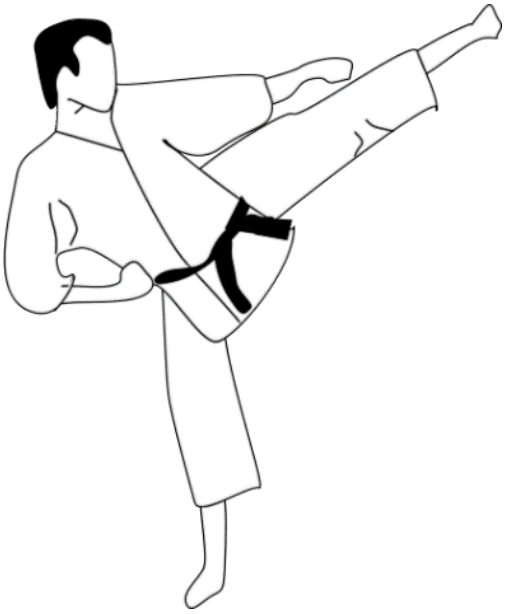
Picture B

[<https://womensvoicesforchange.org/htm>]

Picture C

[<http://www.wikihow.com/Come-up-from-a-Back-Bend>]

Picture D



[<http://www.wpclipart.com/martial_arts/karate/karate_kick.png.html>]

Picture E

[<https://yogaspy.com/>]

[10]

QUESTION 3

Complete the following table of various sporting activities by selecting which of the 3 energy systems is **mostly** used to provide energy for that activity. Tick the appropriate box.

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

[5]

QUESTION 4

Throughout a person's lifetime the type of sporting activity as well as the actual time spent participating in the activity will change. Complete the table below indicating the changes in physical participation.

Phase of life	**Provide TWO examples of sporting activities participating in**	**Approximate time per week spent participating**	**Provide ONE reason for the amount of time spent participating**
Primary school 8–12 years old	(2)	(1)	(2)
High school 13–18 years old	(2)	(1)	(2)
University and tertiary education 19–24 years old	(2)	(1)	(2)
Career and marriage	(2)	(1)	(2)
Old age	(2)	(1)	(2)

[25]

QUESTION 5

Examine the movements listed below and then identify the **axis of rotation** of each movement.

5.1 Leg movement when running _____

5.2 Bowling a cricket ball _____

5.3 Pole Vaulting _____

5.4 Arm movement when swimming freestyle _____

[4]

QUESTION 6

Complete the table below to identify a type of protective clothing used in each of the sports and the reason for its use.

Sport	Type of protective clothing	Reason for using the protective clothing
Cricket batsman	(1)	(2)
Hockey player	(1)	(2)
Waterpolo player	(1)	(2)
Formula 1 motor racing driver	(1)	(2)

[12]

72 marks

SECTION B

QUESTION 7

Read the information in the source below and then answer the questions that follow.

In the early 1920s Professor A. Hill wanted to understand the relationship between the speed a runner could maintain and the amount of oxygen the runner used. His own personal best of 4:45 for a mile (1,6 km) was excellent and he had a VO_{2max} of 57 ml/kg/min. He strapped a ball-and-valve apparatus to his back, so that as he ran the gases he exhaled could be captured and analysed.

Hill was later able to plot the amount of oxygen he consumed – as his speed increased, he used more oxygen. But his oxygen consumption eventually reached a plateau where, no matter how much faster he ran, his oxygen consumption remained the same. Once he reached this plateau, he simply couldn't sustain the pace for very long.

Hill came up with the following explanation:
Every runner has a certain critical speed. When the runner is running below that speed they get enough oxygen to fuel their efforts. But when they have to run faster, the body isn't able to process enough oxygen, and lactic acid builds up, causing fatigue. Hill was the 1st scientist to recognise that we go into what he termed 'oxygen debt' as we exercise.

More recent studies show that at a lower endurance pace, we mainly use the aerobic system. At faster running speeds, we use more and more of the anaerobic system, while still using the aerobic system. As we train at more intense levels, we generate more lactate. The best athletes are those who can use that lactate more efficiently – something that can be improved through training. The trick is being able to clear and process it quickly.

The ability to both produce and reuse lactate is part of what helps separate great athletes from good athletes. In a study that compared trained and untrained cyclists it was found that the trained riders could produce and use about 60% more lactate. That means that they could perform at a much higher percentage of their maximum effort for longer, generating more power and going faster than the other riders, until they reached what we call 'the lactate threshold'.

South African scientist Tim Noakes has challenged beliefs about what limits our performance. Noakes proposes the so-called 'central governor theory'. The argument is that activity is controlled by the brain, which has just one goal: to make sure that nothing in our body is pushed beyond the normal range. So if that's true, then what is fatigue? To Noakes fatigue is an emotion, a construct in the mind that helps ensure that exercise is performed within the body's ability. That emotion is affected by many factors, such as motivation, anger, fear, self-belief and what the body is telling the brain.

[Adapted from 'Faster, higher, stronger' Mark McClusky 2015]

7.1 What was Professor Hill's **VO_2 max**?

(1)

7.2 Explain what is meant by the number in his VO_2 max.

(4)

7.3 Explain the purpose of the apparatus that Hill wore while running.

(2)

7.4 What **conclusions** did Hill come to after he completed the analysis of his exhaled air?

(4)

7.5 According to the source, what substance caused the **fatigue** of Hill?

(1)

7.6 Name **FOUR** signs or symptoms of **fatigue**.

(8)

7.7 In which energy system(s) is **lactate** produced?

(1)

7.8 Suggest **THREE** possible ways that a long distance runner could deal with **oxygen deficit** if they experienced it while running.

(3)

7.9 Name the predominant energy system used during **endurance** events.

(1)

7.10 Name the predominant energy system used during **speed** events.

(1)

7.11 The passage states that 'the ability to both produce and reuse lactate is part of what helps separate great athletes from good athletes'. Describe **TWO** other factors that could separate great athletes from good athletes, explaining why those factors impact on performance.

(6)

7.12 Explain **'onset blood lactate accumulation'/'lactate threshold'**.

(8)

7.13 What is meant by the following terms according to Professor Noakes?

- Central Governor Theory

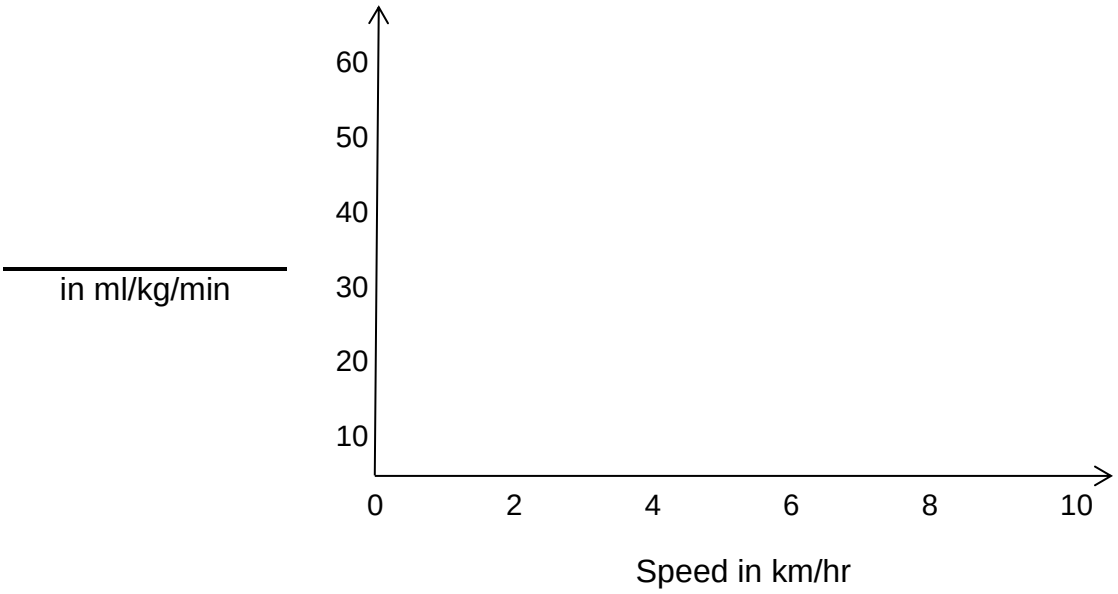
(2)

- Fatigue

(3)

7.14 Using the data that Professor Hill gathered from his run (paragraph 2), complete the graph below.

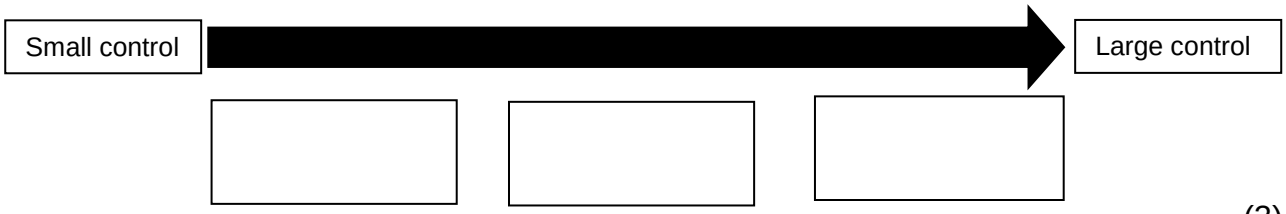
TITLE: _____ (2)



(8)
[55]

QUESTION 8

8.1 Place the three leadership styles – Democratic; Authoritarian and Laissez-Faire – on the provided continuum from the style that gives the leader the **least** amount of control over a team to the style that gives the **most** control.



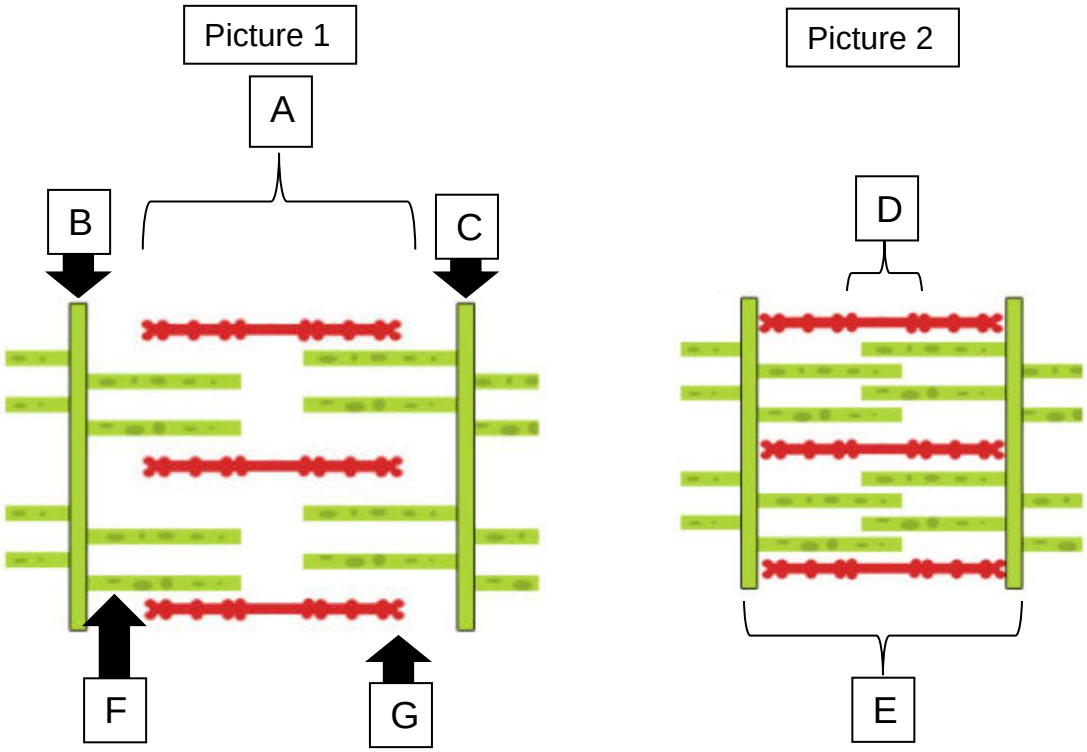
(3)

8.2 Identify **FOUR** skills that are important for a **sports leader** (coach or captain) to have **AND** explain why each of the mentioned skills are important.

(8)
[11]

QUESTION 9

Study the diagrams below and use them to answer the questions that follow.



[Source: <http://www.teachpe.com> Accessed 21/1/17]

9.1 Provide an appropriate **title** for picture 2.

_____

_____ (2)

9.2 Using the pictures provided, give the letter that represents:

(a) The H-zone _____ (2)

(b) The A-band _____ (2)

(c) Myosin _____ (2)

(d) Actin _____ (2)

(e) The two Z-lines _____ and _____ (4)

(f) A Sarcomere _____ (2)

9.3 Describe the **action** that occurs when a muscle contracts. Use the correct terminology and appropriate letters provided in the diagram to help in your description.

(7)
[23]

QUESTION 10

A grade 10 girl who has played team volleyball since grade 8 performed a **reaction time** test.
She was required to return services hit at various speeds.
Below is the data that was collected during the test.

Service speed	Number of successful returns
20 km/hour	9 out of 10
50 km/hour	6 out of 10
80 km/hour	3 out of 10

10.1 From the data provided, what conclusion can you reach regarding this girl's reaction time?

(2)

10.2 Use the data to explain the relationship between **performance** and **reaction time**.

(2)

10.3 How does **anticipation** affect performance?

(2)

10.4 (a) Name **THREE** other factors that could impact on the girl's reaction time.

(3)

(b) Describe **WHY** each of the three factors would impact on the girl's reaction time.

Factor 1:

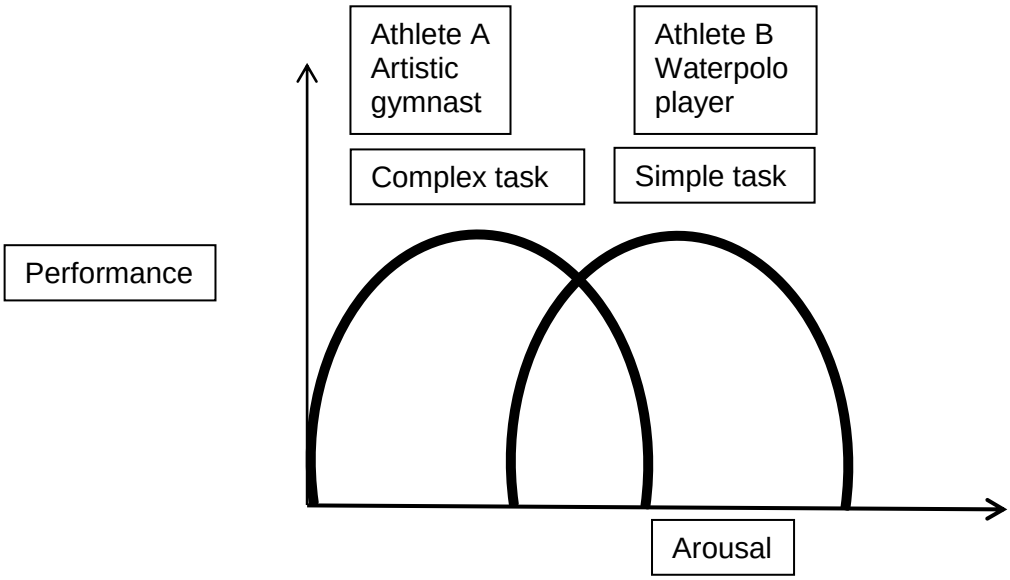
Factor 2:

Factor 3:

(3)
[12]

QUESTION 11

Study the diagram below and answer the questions that follow.



11.1 Which task – complex or simple – requires a higher level of arousal?

_____ (2)

11.2 Provide another sporting example of a **simple** task/skill.

_____ (2)

11.3 Explain **why** the two athletes depicted in the graph might psych themselves up very differently from each other before a major competition.

_____

_____

_____

_____

_____

_____

_____

_____ (6)

[10]

QUESTION 12

The following table shows the percentage of the South African population aged between 15 and 25 years who have met the daily recommended physical activity guideline in different years.

Year	Males aged 15–18 years	Males aged 19–25 years	Females aged 15–18 years	Females aged 19–25 years
2005	74%	70%	60%	50%
2010	77%	72%	63%	50,5%
2016	75%	68%	62%	45%

12.1 What is the **daily** recommended time that should be allocated to physical activity?

_____ (2)

12.2 Identify **THREE** trends depicted in the data provided in the table above **AND** provide possible explanations for each.

_____

_____

_____

_____

_____

_____

_____

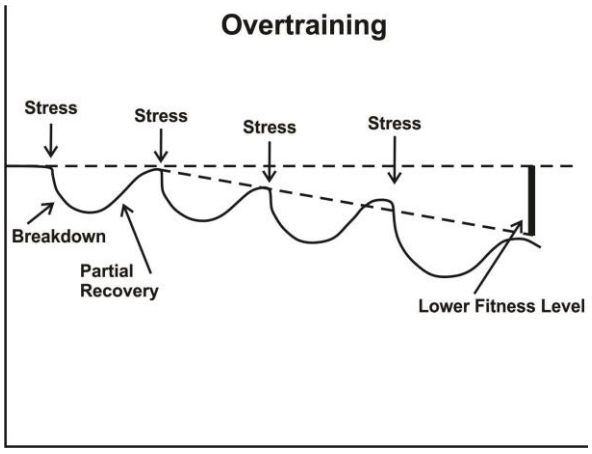
_____

_____ (6)
[8]

QUESTION 13

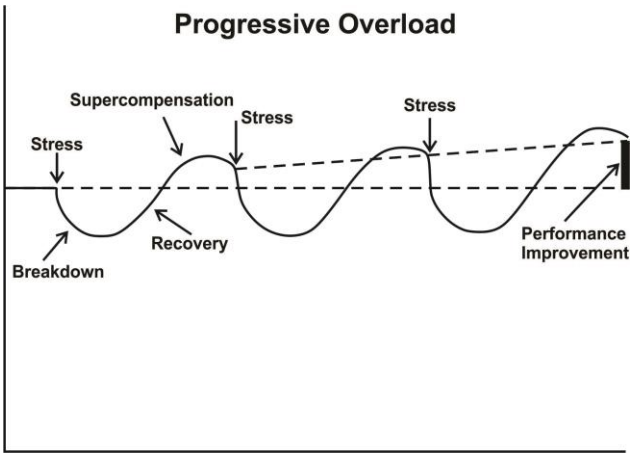
Study the two graphs below and answer the questions that follow.

Graph A



[<http://www.racerxvt.com/article/recovery-training>]

Graph B



[<http://www.racerxvt.com/article_photos/graph_1.jpg>]

13.1 Which graph indicates a decline in performance?

_____ (2)

13.2 Explain your understanding of graph **A**.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ (8)

13.3 Explain the reason for the final fitness level seen in graph **B**.

(4)

13.4 Explain what occurs **physiologically** in the body when the athlete is given adequate rest.

(2)

13.5 Provide **THREE** possible strategies that a coach could include in a training programme to prevent a drop in fitness levels.

(3)
[19]

QUESTION 14

[<http://www.feeltennis.net/learning-technique-adults-kids>]

14.1 Using the pictures provided above, explain the principles of **lever length** when a tennis player hits a forehand shot.

(10)

14.2 State the location of the fulcrum, force/effort and resistance/load in Picture **D** above which shows the **backswing action** of the **forehand stroke**.

(a) Fulcrum –

_____ (2)

(b) Force/effort –

_____ (2)

(c) Resistance/load –

_____ (2)

14.3 Explain each of Newton's Laws **AND** how each applies to the action of hitting a ball when **serving** in tennis.

Newton's First Law:

_____

_____

_____

_____ (2)

Application of Law:

_____

_____

_____

_____

_____

_____ (2)

Newton's Second Law:

_____

_____

_____

_____ (2)

Application of Law:

(2)

Newton's Third Law:

(2)

Application of Law:

(2)
[28]

QUESTION 15

Rugby player A has a mass of 78 kg.
Rugby player B has a mass of 92 kg.

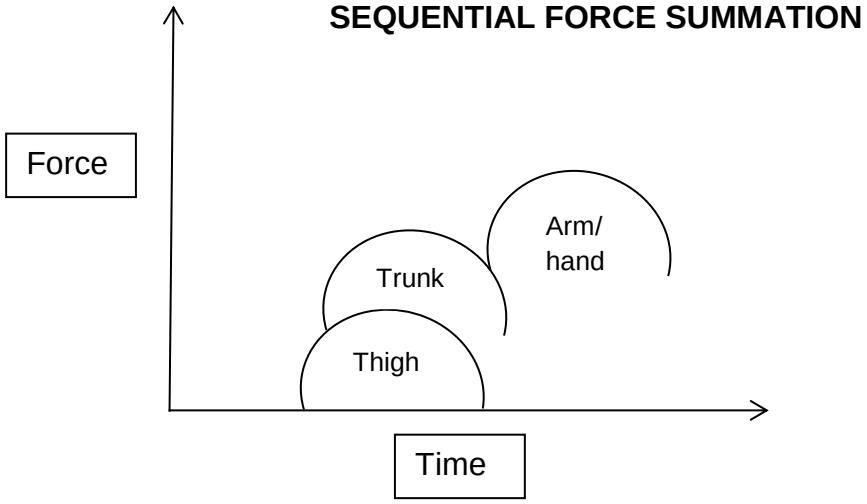
15.1 If these 2 rugby players run towards each other, which player has greater momentum when they tackle each other?

(2)

15.2 Describe the impact on **each** player at the time of the tackle.

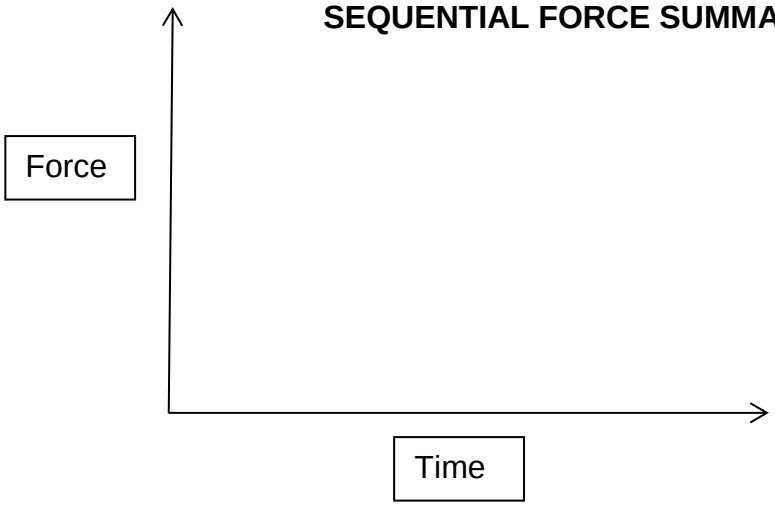
(4)

15.3 Using the following graph on force summation, describe what the athlete is doing **incorrectly** when trying to throw a ball with speed.



(4)

15.4 Complete the graph below to show the ideal movement needed to throw a ball with speed.



(6)
[16]

QUESTION 16

Read the information in the source below and then answer the questions that follow.

The Principles behind One of the World's Most Exciting Sports – Snowboarding

When a snowboarder is at the top of a mountain, he is at rest and not moving. His board has its back edge dug into the snow to prevent movement. With the right incline of the mountain and position of his board, the rider will begin to accelerate down the mountain. Although the snowboarder is accelerating as he leaves the top of the mountain, he also experiences friction all the way down the mountain. The rider experiences air resistance along with resistance from his board against the snow. As the rider progresses down the mountain, he covers more and more distance in the same time frames, ultimately increasing his speed. A rider gains speed going down the mountain by minimising the friction between his board and the snow by carving as little as possible, and maybe even crouching low to minimise air resistance as well.

A snowboarder increases speed by minimising carving. Carving is when the rider shifts weight causing one edge of the board to carve the snow. Carving allows the rider to turn at very high speeds, and also allows a rider to stop rapidly.

In order for the rider to turn going down a slope, there has to be a shift in weight, and ultimately a change in the centre of gravity of the rider.

16.1 What causes the friction under the snowboard?

(2)

16.2 What could the snowboarder do to the snowboard in order to reduce friction?

(2)

16.3 Explain why carving as little as possible would **minimise** friction.

(2)

16.4 In order to remain as **stable** as possible when moving down the mountain at speed, the snowboarder would follow basic stability rules.

(a) Name **THREE** body positions that the snowboarder would use to maintain stability.

(6)

(b) Explain **how** each of the body positions mentioned in Question 16.4.1 would impact on the snowboarder's stability.

(6)

16.5 Describe the **technique** the athlete would use in order to zigzag effectively between slalom poles on the way downhill.

(4)

16.6 Compare the methods used by an ice skater and a snowboarder to come to an abrupt stop.

(4)
[26]

QUESTION 17

SOURCE A

'I still think you throw like a girl!'

[<http://chicksdigthefastball.blogspot.html> Accessed 13/2/17]

SOURCE B

[<www.est.com/explore/gender-discrimination> Accessed 13/2/17]

SOURCE C

2016 Statistics of Television coverage in America

- Women's sport is under reported and under presented in the TV sports news on 3 different networks in America.
- Men's sports received 94% of the airtime. Women's sports – 6%.
- Of 137 interviews conducted with elite athletes – 133 were with male athletes and 4 interviews were with female athletes.
- The number of men's stories that included video clips was far greater than the number of women's stories – 545 compared to 45.

[<www.la84.org>]

Examine the cartoons and the data provided above.

Write an essay of 250–300 words in which you argue that there is gender bias in sport.

To answer this question you are expected to:

- Present an in depth argument that convincingly supports this viewpoint.
- Examine the source material carefully and use the information in the sources to best develop your argument.
- Integrate your own relevant sport science knowledge into your argument.
- Use real-life examples to support your argument.

[20]

228 marks

Total: 300 marks