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NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2018

SPORT AND EXERCISE SCIENCE

EXAMINATION NUMBER

Time: 3 hours 300 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 36 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.

FOR MARKER'S USE ONLY

Question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	**Total**
Marks	36	8	5	6	24	26	14	29	47	17	9	32	12	9	6	20	**300**
Obtained																	

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SECTION A

QUESTION 1

Match a description in column B to the term in column A. Write only the letter of your chosen description in the table below.

COLUMN A		COLUMN B	
1.1	biofeedback	A	A progressive reduction of training load in an attempt to reduce the demands of training and to optimise performance.
1.2	macrocycle	B	Caused by prolonged exposure to cold temperatures.
1.3	Functional Movement Screening	C	This occurs when the body produces or absorbs more heat than it can dissipate.
1.4	Shoulder Mobility Test	D	A thin, contractile protein filament.
1.5	myosin	E	A decreased capacity for work that slowly develops when there is an imbalance between stress and rest.
1.6	tapering	F	Stress management technique that uses electronic instruments.
1.7	in-line lunge test	G	A force causing resistance in water or in the air.
1.8	hyperthermia	H	A thick, contractile protein filament.
1.9	overtraining	I	A grading system used to record movement patterns.
1.10	drag	J	A long plan of training aimed at achieving a long-term goal.
1.11	hypothermia	K	Test bilateral shoulder range of motion.
1.12	actin	L	Caused by prolonged exposure to cold temperatures.

Answers:

1.1	
1.2	
1.3	
1.4	
1.5	
1.6	
1.7	
1.8	
1.9	
1.10	
1.11	
1.12	

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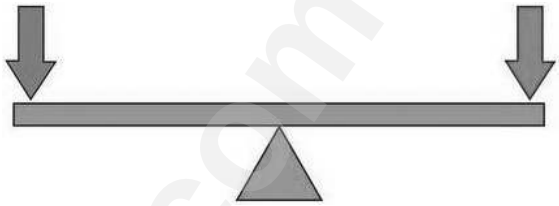
QUESTION 2

State which lever class is depicted in each of the pictures below. Write your answer in the space provided below.

Picture A

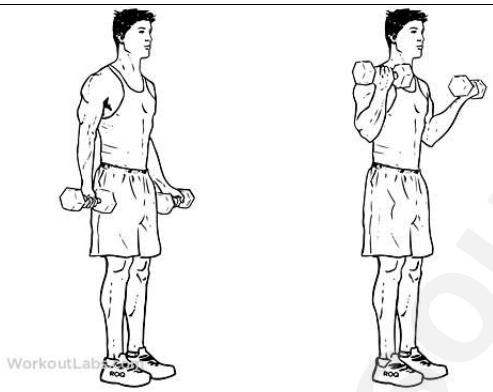
[Source: <https://baseball+batter.> Accessed 29/1/18]

Picture B



[Source: <https://1st+class+lever&source.> Accessed 29/118]

Picture C



[Source: <https://bicep+curl&oq=bicep+curl.> Accessed 29/1/18]

Picture D

[Source: <https://calf+raises.> Accessed 29/1/18]

Answers:

Picture A: _____ (2)

Picture B: _____ (2)

Picture C: _____ (2)

Picture D: _____ (2)

[8]

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QUESTION 3

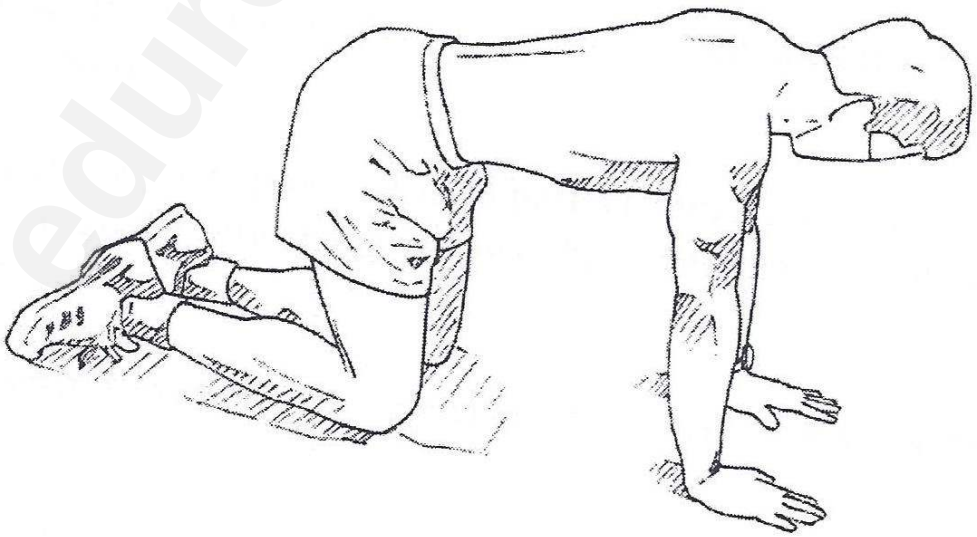
Outline **AND** shade in the Base of Support in each of the following pictures.

Picture A

[Source: <https://wwwdance&g>R Accessed 29/1/18]

(3)

Picture B



[Source: <https://kneel+on+hands> Accessed 29/1/18]

(2)
[5]

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QUESTION 4

Match one of the terms provided to the motion found in each picture. Write your answer in the space provided below.

Picture 1	Picture 2	Picture 3
(ice skater spinning) [<https://ice+skating+spin> Accessed 29/1/18]	[Source: <https://froome&oq=froome> Accessed 29/1/18]	(gymnast on high bar) [Source:<https://gymnastgiant+circle +on+bar&gs> Accessed 29/1/18]

Terms:
A – angular motion
B – linear motion
C – general motion

Answers:

Picture 1: _____ (2)

Picture 2: _____ (2)

Picture 3: _____ (2)
[6]

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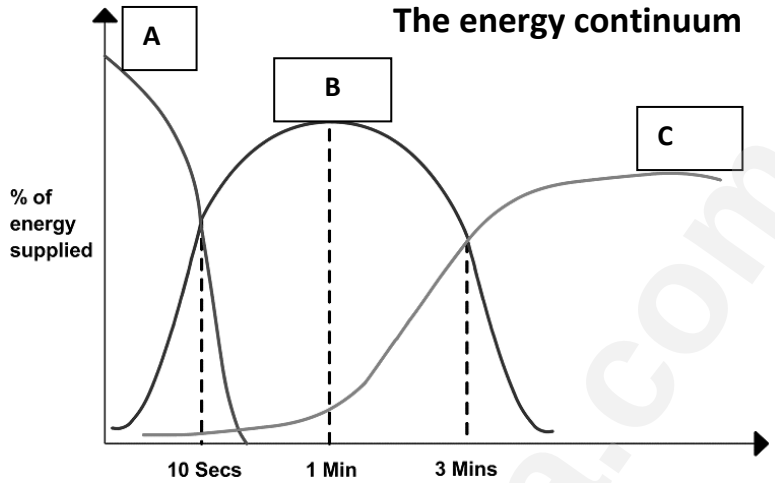
QUESTION 5

Study the graph below and then answer the questions that follow.



[Source: <https://www.google.energy+systems>. Accessed 5/3/18]

5.1 State which curve best represents the:

(a) aerobic energy system _____ (2)

(b) ATP/PC energy system _____ (2)

(c) lactic acid system _____ (2)

5.2 State which energy system(s) require oxygen.

_____ (2)

5.3 Name ONE by-product of the aerobic system.

_____ (1)

5.4 What intensity does the ATP/PC system operate in?

_____ (1)

5.5 What fuel sources do the aerobic systems use?

_____ (2)

5.6 What effect does lactic acid have on performance?

_____ (1)

5.7 Name one by-product of the ATP/PC system.

_____ (1)

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

	ENERGY SYSTEMS		
	ATP/PC system	**Lactic acid system**	**Aerobic system**
400 m sprint			
Arm wrestling			
Basketball jump shot			
Race walking			
Volleyball spike			

(10)
[24]

79 marks

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SECTION B

QUESTION 6

6.1 Complete the table below by naming two factors under each of the headings that could cause obesity.

	Economic	Cultural/Societal	Environmental
Factor 1:	(2)	(2)	(2)
Factor 2:	(2)	(2)	(2)

6.2 Expand on ONE factor from each column explaining **how** it impacts on or could cause obesity.

(a) Economic:

_____

_____

_____

_____

_____ (2)

(b) Cultural/Societal:

_____

_____

_____

_____

_____ (2)

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(c) Environmental:

_____

_____

_____

_____

_____ (2)

6.3 Suggest FOUR strategies that could be implemented in South Africa to slow down or prevent the development of childhood obesity.

_____

_____

_____

_____

_____

_____

_____

_____ (4)

6.4 Office workers tend to gain weight due to the sedentary nature of their job. Recommend FOUR exercises that an office worker could perform while seated at a desk.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ (4)

[26]

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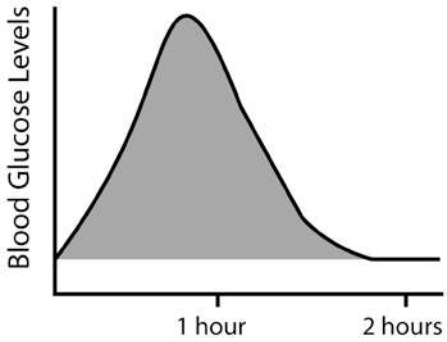
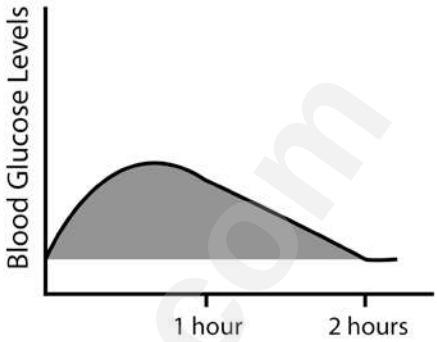
QUESTION 7

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

Graph A: White bread



Graph B: Lentils



[Source: <https://high+gi+food&source>. Accessed 30/1/18]

7.1 Explain the difference between the blood glucose responses to the two foods: what is different and why?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ (8)

7.2 How might an athlete use this knowledge to their advantage?

_____

_____

_____

_____

_____ (2)

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7.3 What is the glycaemic index?

_____

_____

_____

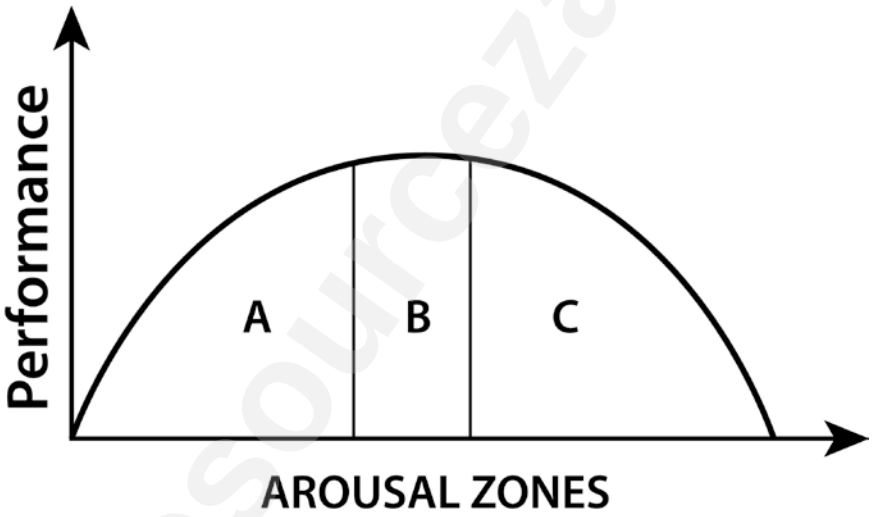
_____

_____ (4)

[14]

QUESTION 8

Examine the graph below depicting the Yerkes-Dodson Inverted-U hypothesis.



8.1 Complete the table below by identifying the mental and physical state of the athlete in each of the zones depicted.

	Zone A	Zone B	Zone C
Name two **mental** states	1. 2. (2)	1. 2. (2)	1. 2. (2)
Name two **physical** states	1. 2. (2)	1. 2. (2)	1. 2. (2)

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8.2 Explain why athletes may have differing levels of optimal arousal.

(8)

8.3 Provide TWO stress-management techniques that could be used to control anxiety.

(4)

8.4 How can a coach move someone from an under-aroused state to the optimal state?

(2)

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8.5 How can a coach move someone from an over-aroused state to the optimal state?

_____

_____

_____

_____

_____ (2)

8.6 Which of the following is necessary for an athlete to achieve optimal performance? Write the letter of your choice.

A – balance between mental rehearsal and stress
B – maximum levels of stress
C – balance between anxiety and arousal

_____ (1)

[29]

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QUESTION 9

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

ARMS
His large, muscular arms act like pendulums, counter-balancing his pumping legs to keep him steady.

SIZE MATTERS
Being 1,95 m tall allows Usain Bolt to take longer (and fewer) steps over a 100 m race than his smaller rivals. In London 2012 he took 41 strides to win the Olympic final. His competitors take on average 44 strides to get over the finish line.

Why is Usain Bolt so quick?

LEGS
He has longer legs than the average sprinter competing in the 100 m. Although this gives him bigger strides there's a drawback too. Longer legs take longer to accelerate and give him weak starts.

TRAINING
In the run-up to the Olympic Games, Bolt would have required more energy than during the Games itself.

9.1 Why would Usain Bolt need more energy before the Olympic Games than during the Games?

_____

_____

_____

_____

_____ (2)

9.2 What is meant by the term "carbo-load"?

_____

_____

_____

_____

_____ (3)

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9.3 Why do endurance athletes need to carbo-load?

_____

_____

_____

_____

_____ (4)

9.4 Name TWO types of foods that an athlete would eat when carbo-loading.

_____

_____ (2)

9.5 Why is it so important for an athlete to eat protein?

_____

_____

_____

_____

_____ (3)

9.6 What is Usain Bolt's predominant muscle fibre type?

_____ (2)

9.7 (a) Bolt has several anatomical advantages over his rivals. Name THREE physical advantages mentioned in the source.

Advantage 1:

_____

_____ (1)

Advantage 2:

_____

_____ (1)

Advantage 3:

_____

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(b) Select ONE of these anatomical advantages and explain **why** it is advantageous.

_____

_____

_____

_____

_____ (2)

9.8 What are the effects of cardiac hypertrophy and bradycardia on Usain's heart during training?

_____

_____

_____

_____

_____ (4)

9.9 (a) Explain the term "VO_2max".

_____

_____

_____

_____

_____ (4)

(b) What is the relationship between VO_2max and aerobic performance?

_____

_____

_____

_____

_____ (2)

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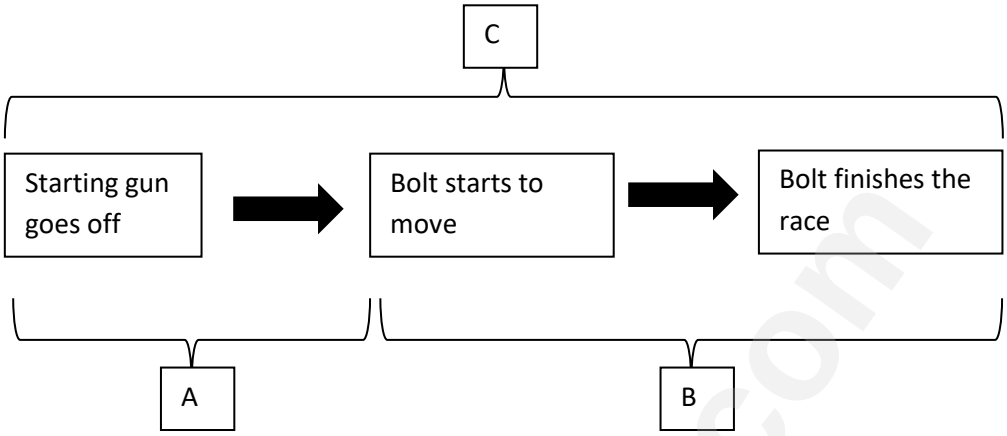
9.10 The diagram below depicts Bolt's reaction time. Provide labels for A, B and C.



A refers to _____ (2)

B refers to _____ (2)

C refers to _____ (2)

9.11 How would a coach design a one-year training program using periodisation?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ (7)

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9.12 **Why** should periodisation be included when planning and designing a training program?

_____

_____

_____

_____

_____ (3)

[47]

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QUESTION 10

10.1 Explain the role of actin and myosin filaments during muscular contractions.

_____

_____

_____

_____

_____ (4)

Refer to the diagrams below to answer 10.2 and 10.3

[Source: <https://weightlifting&source> Accessed 5/2/18]

10.2 Explain the function(s) of both the Golgi tendon AND muscle spindles in the pictures above.

_____

_____

_____

_____

_____

_____

_____

_____

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(8)

10.3 By referring to the pictures on the previous page, explain the "**all-or-none law**".

(5)
[17]

QUESTION 11

Consider the following situation:

An athlete (A) is on a training run. After about 10 minutes she reaches an aerobic steady state. Up ahead she notices another athlete (B) coming from a different direction and about 50 m ahead of her. Athlete A is competitive so she decides to increase her speed in order to pass athlete B.

11.1 Where will the extra ATP needed to increase her pace come from?

(2)

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11.2 Once athlete A has overtaken athlete B, she has to maintain her new pace in order to stay ahead.

Which energy system will athlete A predominantly use now?

_____

_____

_____

_____

_____ (2)

11.3 How does athlete A "pay back" oxygen debt?

_____

_____

_____ (1)

11.4 Describe lactic acid debt in the excess post-exercise oxygen consumption (EPOC) process.

_____

_____

_____

_____

_____ (4)

[9]

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QUESTION 12

12.1 Technology has impacted on most sports, including tennis.

(a) List FOUR advances in technology found in tennis.

(4)

(b) Explain **how** each of the four advances in technology listed above has improved tennis.

(8)

12.2 Explain the impact of a "fast" court on a tennis player's opponent.

(2)

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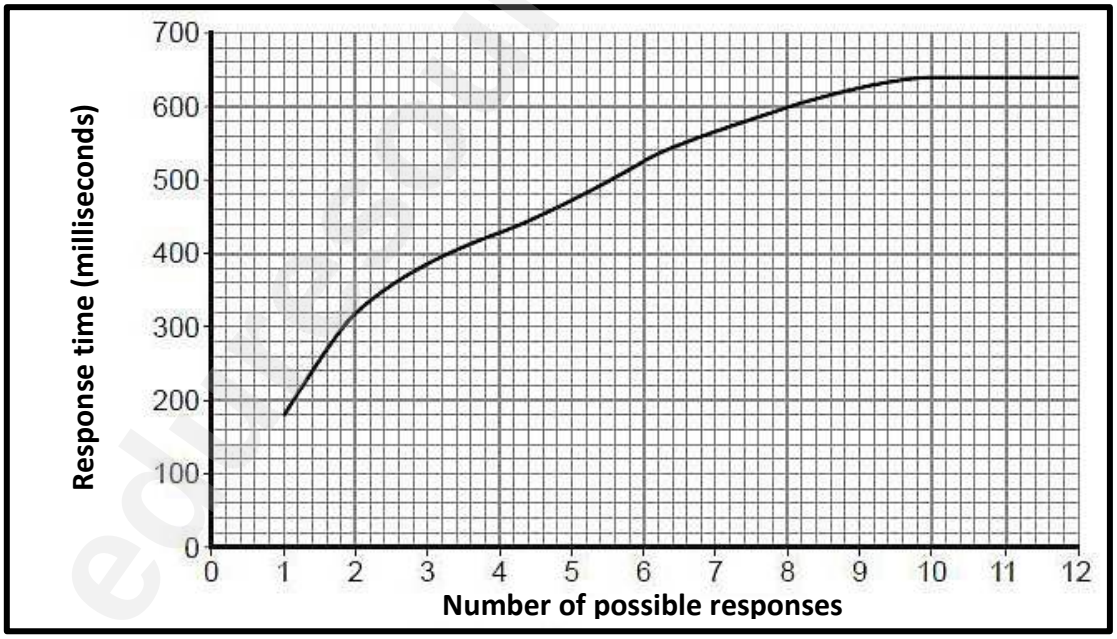
12.3 How is it that wrist flexor muscles can perform delicate, fine movements like holding a pen and yet can also perform a gross movement like gripping a tennis racket?
Use words like *motor unit* and *muscle fibres.*

(5)

12.4 Below is a graph depicting a tennis player's reaction time.



Interpret the data in this graph.

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(6)

12.5 What is the difference between the distance that can be achieved by a topspin shot and a backspin shot?

(2)

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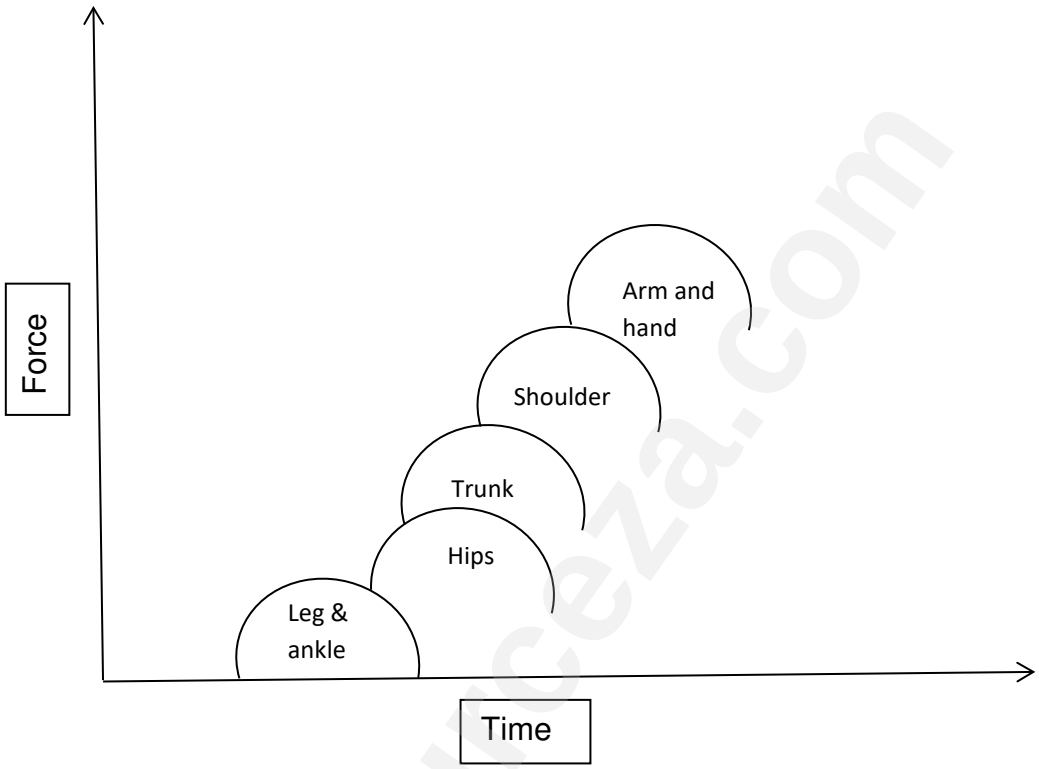
12.6 Using the following graph on force summation, describe what the athlete is doing incorrectly when hitting a tennis forehand shot.

SEQUENTIAL FORCE SUMMATION



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(5)
[32]

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QUESTION 13

Explain and apply each of Newton's laws to the picture of a soccer player below.

[Source: <https://www.soccerplayer+kickingball> Accessed 31/1/18]

Newton's first law:

_____

_____

_____

_____ (2)

Application of law:

_____

_____

_____

_____

_____ (2)

Newton's second law:

_____

_____

_____

_____

(2)

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Application of law:

(2)

Newton's third law:

(2)

Application of law:

(2)
[12]

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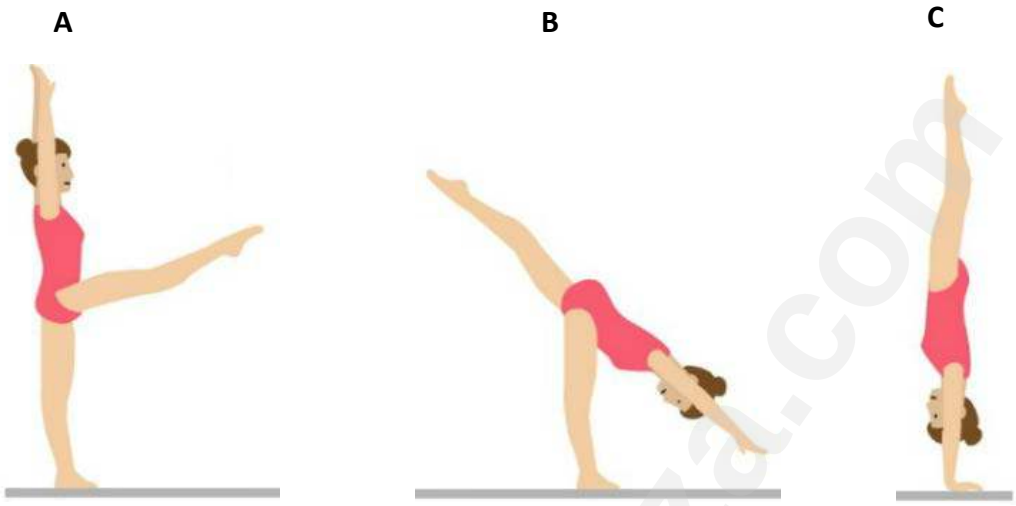
QUESTION 14

In the pictures below the gymnast is performing a handstand. Use the pictures and the words provided to write a brief description of the gymnast's movements.



centre of gravity	base of support	action	stable
unstable	reaction	balance	line of gravity
angular momentum			

Movement A:

_____

_____

_____

_____

_____ (3)

Movement B:

_____

_____

_____

_____

_____ (3)

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Movement C:

(3)
[9]

QUESTION 15

All Olympic shot putters are taller than 180 cm and weigh at least 100 kg. They can also run the 100 m in approximately 11 seconds.

How would each of these attributes be an advantage to them?

[6]

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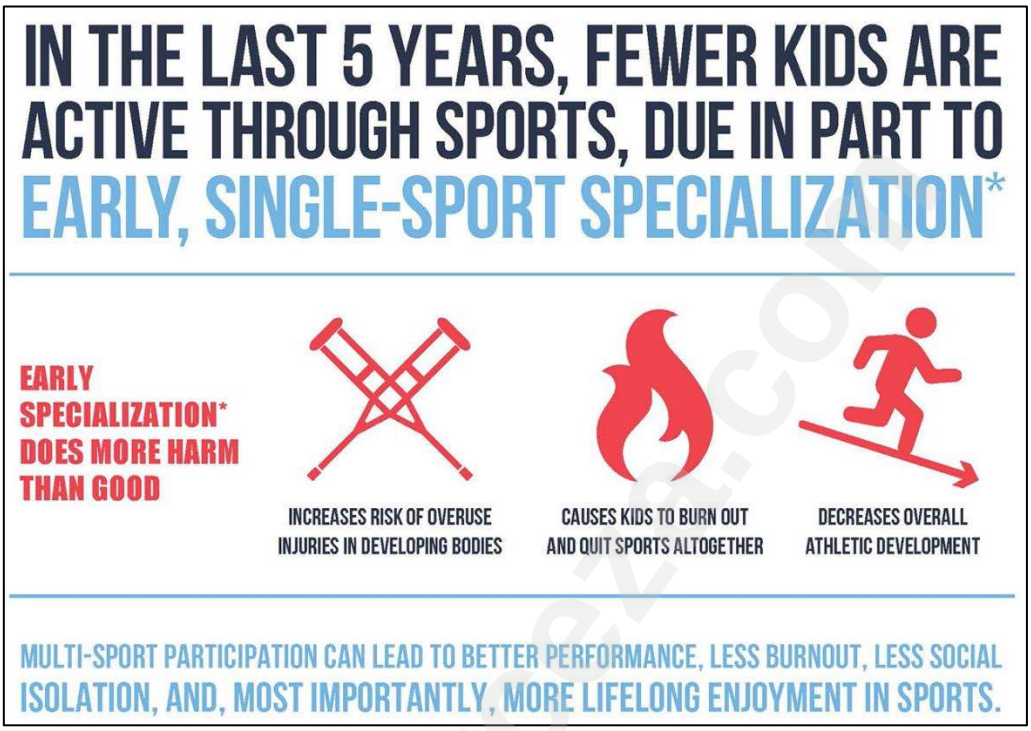
QUESTION 16

SOURCE A



[Source: <https://www.google.co.za/early+specializationsports&safe> Accessed 3/6/18]

SOURCE B

Youth sports burnout

Most of us are familiar with feeling burned out. What you might not know is that young athletes are capable of getting burned out, too. Burnout is defined by sport psychologists as "physical/ emotional exhaustion, sport devaluation, and reduced athletic accomplishment". This is an important issue in youth sports because it is thought to contribute to dropping out of sports altogether. Given the tremendous benefits that accompany exercise and sport participation, the athlete who gives up sport participation is also giving up the important health benefits. Even at a young age, children are developing lifestyle patterns that will carry over into adulthood. Active youth are much more likely to be active adults. But if we allow our youth to become burned out of sports, this may become a barrier to leading a healthy lifestyle as an adult.

[Source: <http://educatedsportsparent.com/athlete-burnout/>]

SOURCE C

Bjorn Borg assessed what tennis truly meant to him

During a seven-year stretch, Borg won eleven Grand Slam titles, including five straight Wimbledons and six French Open championships – a record until Rafael Nadal broke it in 2012. The Swede was also the first player ever to earn more than a million dollars in prize money in a single tennis season. And yet, at 26, during the peak of his career, he retired. Borg has admitted that he lost the burning drive and passion to succeed in the sport.

[Jordan Schultz The Huffington Post]

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Carefully read the provided sources, as well as the rubric. Use them to answer the following question.
Write an essay of 250–300 words in which you argue that **early specialisation in sport is detrimental to an athlete**.

To answer this question you are expected to:

- Present an in-depth argument that convincingly supports this statement.
- 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.

ESSAY RUBRIC

	1 mark	**2 marks**	**3 marks**	**4 marks**	**Possible mark (20)**
Statement	Vague. Disagree with statement in essay.	Clear statement made.			2
Use of knowledge from sources	Reference made to one source only.	Reference made to two sources.	Several and appropriate references made to all sources.	Source detail fully utilised to support argument.	4
Content relevance	Repetition mostly avoided. Some minor digression. Supporting argument relevant.	Repetition mostly avoided. Some minor digression. Supporting argument relevant. Quality of source extracts accurate.			2
Quality of argument supporting statement	Writing consists of facts with little linkage or reasoning.	Reasoning correct but hard to follow. Some linkage evident.	Supports the statement. Reasoning is clear. Minor errors in flow. Linkage is sometimes missed.	Strongly supports the statement. Reasoning is very clear and succinct. Flow is logical. Compelling with regular linkage. Well-integrated argument.	4
Use of own knowledge × 2	Some facts beyond the sources given to support argument.	Some facts beyond the sources given to support argument AND integrated into the argument.	Many facts beyond the sources given to support argument.	Many facts beyond the sources given to support argument AND integrated into the argument.	8

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[20]

221 marks

Total: 300 marks

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