

# Candidate Marks Report

## *Series : 6 2018*

This candidate's script has been assessed using On-Screen Marking. The marks are therefore not shown on the script itself, but are summarised in the table below.

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Centre No :	Assessment Code :	H555
Candidate No :	Component Code :	01
Candidate Name :		

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Total Marks :

In the table below 'Total Mark' records the mark scored by this candidate.  
'Max Mark' records the Maximum Mark available for the question.

## Section A

Answer all the questions.

- 1 Define what is meant by 'acclimatisation to high altitude' and state one sporting activity in which performers would benefit from it.

Acclimatisation is the adaption of the body to a change in partial ~~and temperature~~ pressure of gases such as  $PO_2$  and  $pCO_2$ . Football players would benefit from acclimatisation. [2]

- 2 Explain why ATP plays a major role in the performance of a smash in badminton.

A smash is an explosive movement that lasts for no longer than 10 seconds. It works in the anaerobic energy system and therefore the ATP-PC system is used to provide energy for action as a short burst of exercise. [2]

- 3 Identify two types of spin and the effect of each on a table tennis ball in flight.

Topspin results in the table tennis ball having a shorter flight distance, causing ball to move downwards. Hook spin causes the ball to deviate to the left of original flight. [2]

- 4 Compare explosive strength and strength endurance.

Explosive strength is the ability to exert maximal force over repeated actions. Strength endurance is the ability for muscular contraction repeatedly without fatigue. [2]

- 5 Describe how limb kinematics can be used to enhance performance in sport.

Limb kinematics is used to improve technique of a performer by producing a visual analysis of movement. Sensors are attached to the body which then relay information into a computer. It can enhance performance by showing what an athlete does wrong in a movement. [2]



## Section B

Answer all the questions.

- 6 Fig. 1 shows a netballer preparing to shoot.

wrist flexors  
wrist extensors



Fig. 1

- (a) Complete the table below to analyse the position of the right wrist.

Joint type	Articulating bones	Plane of movement	Movement	Agonist	Antagonist
condyloid	carpals radius ulna	sagittal	Flexion	wrist flexors	wrist extensors

[6]

- (b) Explain what the energy continuum is and justify the position of one sporting activity on the energy continuum.

The energy continuum is the placement of actions/movements depending on their predominant energy system. In netball a WA when the whistle is blown will use the ATP-PC system to sprint out for the centre pass. If her team lose possession then they may adopt man-on-man marking. This will then be in the glycolytic energy system. [4]



- (c) At the start of an endurance cycling event a cyclist will experience a redistribution of cardiac output.

Explain how and why the vascular shunt mechanism redistributes blood in a cyclist as they begin cycling at the start of the event.

The vascular-shunt mechanism will redistribute blood by vasoconstriction and vasodilation. The pre-capillary sphincters to ~~muscle~~ <sup>organ</sup> cells at rest will be vasodilated and pre-capillary sphincters to muscles at rest will be vasoconstricted. During exercise the vascular shunt mechanism results in pre-capillary sphincters to muscles vasodilating and to organs vasoconstricting. This will then result in an increased blood flow to muscle cells. This will mean that the muscle cells will have a <sup>increased</sup> [5]

- (d) (i) Describe the mechanics of breathing which cause inspiration at rest.

At rest the external intercostal muscles will contract, pulling ribs up and out. The diaphragm will also contract pulling it into a flattened shape. These measures will increase the volume within the thorax, thus decreasing the pressure. The pressure inside thorax is lower than that of atmospheric <sup>air</sup> [3] so air moves into thorax, down concentration gradient.

- (ii) Explain why a trained athlete will have a lower minute ventilation at rest than an untrained individual, despite having identical tidal volumes.

A trained athlete will have a lower breathing rate as they will have stronger respiratory muscles, and a greater surface area ~~for~~ of alveoli. This therefore reduces breaths per <sup>[2]</sup> minute, and lower minute ventilation as  $VE = f \times TV$ .



- 7 (a) Blood doping is an illegal physiological aid used by some athletes to enhance performance.

Outline how blood doping is carried out, and give one physiological benefit and one risk involved.

Blood doping is carried out by 2-3 weeks before performance a volume of blood is removed from an athlete, then 2-3 days before performance this blood is transfused back into the body. A benefit is that it results in an increase in number of red blood cells, thus increasing oxygen carrying capacity. However [31]

- (b) A dislocated shoulder in rugby is an example of an acute sporting injury.

- (i) Compare acute and chronic injuries.

Acute chronic injuries are a result of a dramatic event such as a collision. Chronic injuries occur as overuse injuries over a period of time. [2]

- (ii) Apart from dislocation, give a sporting example of an acute injury and a chronic injury.

An acute injury is a complete fracture. Chronic injury could be shin splints. [1]

- (iii) Outline the correct medical treatment a sports coach should apply to a dislocation injury.

A coach should remove player from the game. They may put shoulder into a splint but must wait for a medical professional to place dislocation back into the joint, otherwise this may cause further damage. The coach may provide anti-inflammatory and pain relief drugs and may use ice to reduce pain and swelling. An ambulance may be called for athlete. [3]



(c) Fig. 2 shows a gymnast performing the splits.

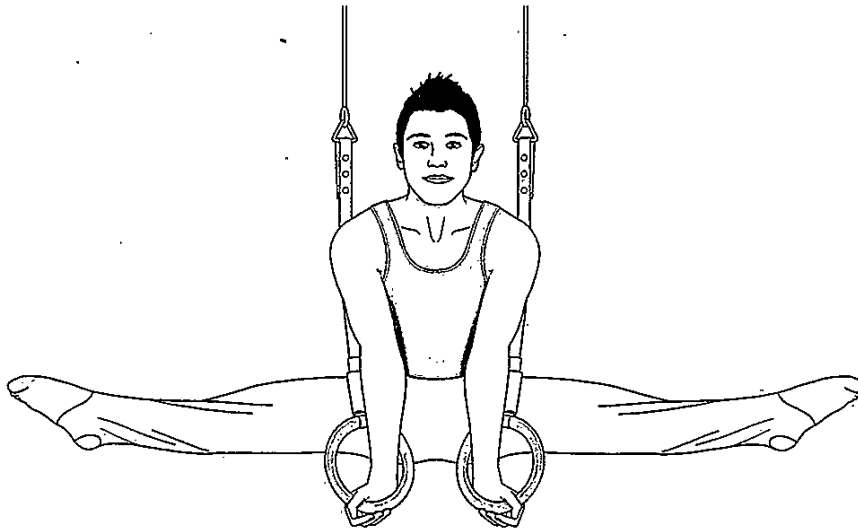


Fig. 2

- (i) Describe the factors affecting flexibility that enable the gymnast to perform the splits.

A factor which affects flexibility is the type of joint, a ball and socket joint will provide a greater range of motion than a hinge joint. Age will affect flexibility with flexibility decreasing as age increases due to loss of elasticity of muscle and connective tissue. Gender will also affect with women being more flexible than men. [3]

- (ii) Describe two adaptations from training that have enhanced this gymnast's flexibility by increasing the range of motion at the hip joint.

An adaptation of training is increased elasticity of connective tissue which allows greater range of motion. Also an increased resting length ~~with~~ of muscles due to training that causes ~~later~~ greater motion before stretch reflex. [2]



- (d) Describe a high intensity interval training (HIIT) session to improve aerobic capacity, and give two reasons why HIIT is considered more effective than continuous training.

A HIIT workout is periods of intense exercise followed by periods of recovery. A HIIT workout will have a specific number of repetitions for example a workout may include ~~10~~<sup>5</sup> sprints (~~10~~<sup>5</sup> reps) with sprinting for 15 seconds with a 45 second recovery rate. This would make up a set. Then you would repeat this 5 times which would be 5 sets. As a HIIT workout is high-intensity, work to relief ratios should be 1:3<sup>or</sup> 1:2 to allow recover to prevent <sup>onset of</sup> blood lactate accumulation which could prevent exercise causing fatigue. This session should be repeated <sup>2-3</sup><sub>[6]</sub> times a week. Before the workout the athlete



- 8 (a) Define Newton's third law of motion and apply it to a sporting example of your choice.

Newton's third law states that for every action there is an equal but opposite reaction. For example in high jump the greater force the athlete applies to the ground, the greater the reaction force will be which will lead to the athlete extending further off the ground and able to achieve higher jumps to pass the bar.

- (b) (i) Using practical examples, explain how the elbow joint can act as a fulcrum for two different lever systems.

The elbow can act as the fulcrum for a third class lever, for example for the flexion of the elbow the effort is in the middle as the biceps brachii extends over the joint and the load is at the end. However the elbow joint can also act as a first class lever for extension of the elbow by triceps brachii with the fulcrum being in between effort and load. [4]

- (ii) Calculate the moment of inertia during a biceps curl, given a total mass of 10 kg at a perpendicular distance ( $r$ ) of 0.5 metres from the weight to the fulcrum. Show your workings.

$$MI = \sum mr^2 = \sum (\text{mass} \times \text{perpendicular distance from axis}^2)$$

$$MI = \sum (10 \times 0.5^2)$$

$$MI = 2.5 \text{ kg/m}^2$$

[2]





- (c) Fig. 3 shows a graph of the relationship between moment of inertia, angular velocity and angular momentum during the performance of a tucked somersault.

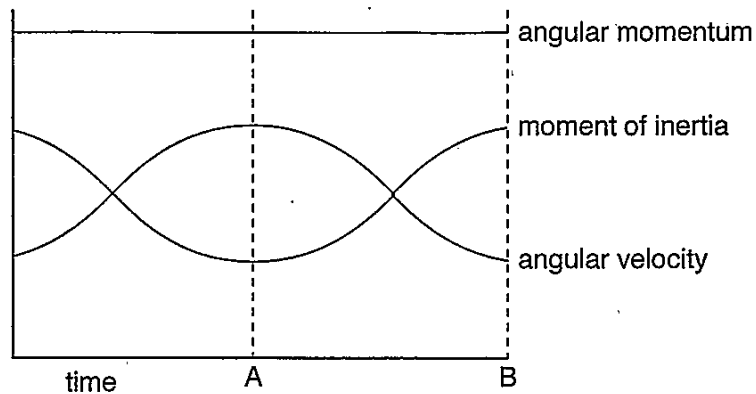


Fig. 3

- (i) Explain the shape of the graph, with reference to the tucked somersault, from A to B.

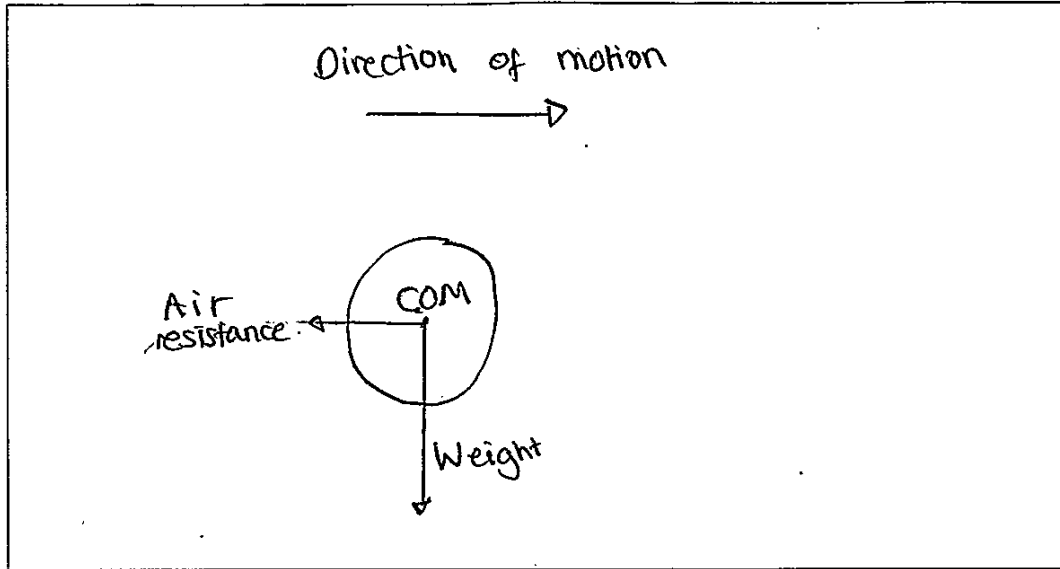
Angular momentum is conserved, so remains the same as it is the sum of angular velocity and moment of inertia. When moment of inertia is high, angular velocity is low. So when athlete is in the tucked position it decreases moment of inertia as mass is distributed near axis of rotation, this [3]

- (ii) Explain, using the angular analogue of Newton's first law of motion, the concept of conservation of angular momentum.

angular analogue of Newton's first law states that a rotating body will continue to rotate around axis of rotation ~~unless~~ at a constant angular ~~velocity~~ momentum unless acted upon by an eccentric force ~~which~~ as (torque). This law states that angular momentum is conserved once [3] created unless acted upon by a eccentric force which will cause a change in momentum

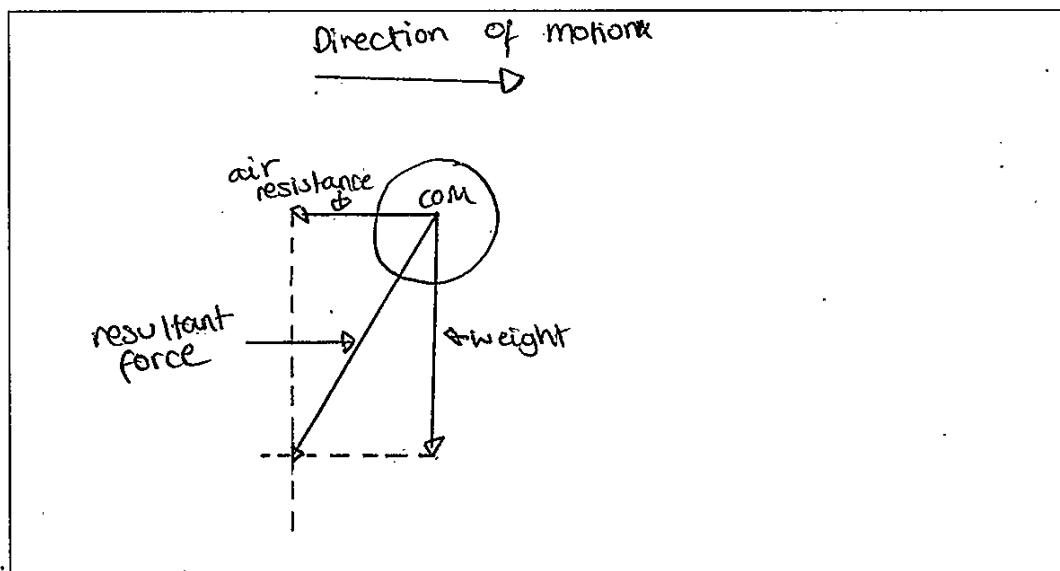


- (d) (i) Sketch a free body diagram in the box below, showing the horizontal and vertical forces acting on a football in flight.



[2]

- (ii) Sketch a diagram in the box below to show how you would represent the resultant force acting on the football in flight.



[3]



- 3 minutes ✓
  - ATP PC ✓
  - Myoglobin ✓
  - haemoglobin ✓
  - fast lactacid ✓
  - Maintenance of ventilation/circulation ✓
  - 9\* A team game such as basketball provides opportunities for recovery from high intensity work both during and after the match.
- Nutritional aids
  - Carbohydrate after a
  - ice baths 11
  - Nitrate
  - bicarbonate Section C
  - creatine
- Basketball
  - Keep time
  - Warm up
  - Injury time
  - Strategy
  - zone marking
  - heavy players
  - hydrated
  - snacks
  - intensity

Outline the recovery processes that occur in the first three minutes after exercise and, using a team game of your choice, evaluate the strategies that a player or coach can use to maximise recovery.

Evaluate nutritional ergogenic aids that help the recovery process. [20]

Within the first three minutes of exercise there will be the resynthesis of ATP and PC stores. This is caused by phosphagen stored in the body. Phosphagen binds with ADP to synthesise ATP and creatine to form phosphocreatine. 50% of PC stores will be replenished in 30 seconds and 100% replenished in 3 minutes. Also within the first three minutes of recovery will be the replenishment of haemoglobin and myoglobin stores. Within the first three minutes haemoglobin will become full saturated with oxygen which forms oxyhaemoglobin. There will also be saturation of myoglobin which stores oxygen and then delivers oxygen to mitochondria. These processes occur within the first three minutes and are components of the fast lactacid component of recovery. This process requires 1-4 litres of oxygen and accounts for 10% of EPOC, which is excess-post exercise oxygen consumption. In a game such as basketball a coach will adopt a number of strategies in order



to maximise recovery. A coach will call time out in basketball which will allow players to have a decreased intensity which will then allow resynthesis of PC and ATP stores of haemoglobin saturation. Furthermore when a coach calls time out he may tell the athletes to have a quick supplement of glucose such as glucose tablets. This glucose will then allow the athletes to have increased levels of energy in order to work aerobically ~~and~~ for longer. The time-outs will also reduce intensity to allow body to recover a little to then use aerobic system to reduce lactic acid accumulation. A coach may also tell athletes to hydrate and will give them drinks that may be isotonic. This will ensure that athletes uptake water and glucose. This water will then prevent dehydration which is caused by the loss of electrolytes. ~~help to~~ This will aid recover process, and <sup>help to</sup> prevent athlete to collapse due to dehydration. Another strategy a coach may adopt is the use of different ~~str~~ tactics during a game. For example in basketball the coach may change man-on-man marking during a

END OF QUESTION PAPER



## ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).

6 b) Then the WA ~~is~~ jogging back into position once a goal has been scored will then be in the aerobic energy system.

6 c) amount of oxygen being delivered to the cells. This will then set up steep concentration gradients and will result in muscle cells having more oxygen to use for aerobic respiration thus reducing lactic acid build up and fatigue. This will then allow the cyclist to perform at a higher intensity for longer. <sup>before fatigue</sup> The body does this as muscle cells have a greater demand for oxygen once exercise begins.

6 di) via diffusion from high to low concentration.

7 a) Blood doping can lead to increased viscosity of blood which <sup>could</sup> result in clots.

7 d) should undertake a warm-up and then



a cool down to help prevent injury, speed up recovery process and prepare body for exercise. Also pre-tests may be conducted to test ability and capability of athlete to perform training. It should also be made progressively harder by increasing number of sets for example. A HIIT workout is more effective than a continuous workout as it causes adaptations to occur at a faster rate, such as capillarisation. Also a HIIT workout continues to increase metabolism throughout the day not just in the session.

8c)  $I$  then increases angular velocity. However when athlete prepares to land and comes out of tucked position, <sup>pulls arms out</sup> mass is distributed away from axis of rotation,  $M I$  increases and angular velocity decreases.

9) high-intensity moment of the game to zonal defence. Zone defence requires less energy than man-on-man marking. By adopting zone defence this will allow players to have periods of recovery within the game.



~~AN~~ This will then allow an athlete to replenish and resynthesise stores. This will not only impact fast alactacid component of recovery but will also impact ~~over~~ slow lactacid component as the athletes can replenish oxygen stores ~~it~~ means that they can work aerobically for longer before fatigue. This will then mean that less lactic acid is produced during exercise and therefore less lactic acid that needs to be removed in the recover process.

Additionally, quarter times and half-time will provide athletes to recover with lower intensity. A coach may make athletes continue to do low aerobic activity such as walking around during breaks in order to maintain ventilation and circulation which will ~~prevent~~ aid in recovery by providing high levels of oxygen to respiring muscles. Also a coach may make athletes complete a warm up before exercise this will enable increasing speed of nerve transmission, increased temperature for function a enzymes and increased transport of oxygen to



respiring muscles. This will aid recovery as it will reduced oxygen deficit once exercise occurs. A coach will also make athletes complete a cool down to prevent blood pooling, prevent muscle stiffness and maintain respiratory and cardiovascular ~~muscle~~ systems which will aid in removal of CO<sub>2</sub>, lactic acid by providing O<sub>2</sub> to respiring muscles. A coach can also adopt strategies after performance such as making athletes sit in an ice bath to aid recover by causing vasoconstriction of <sup>blood</sup> vessels which will then be flushed with oxygen once athlete leaves ice bath. Coach could also ensures athletes have a sports massage which will aid in the removal of lactic acid. A coach in basketball may also call injury time in order to allow players to recovery with decreased intensities.

Nutritional ergogenic aids can be highly beneficial to performance. However,

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Write here how many booklets you have used in total 2 (1 extra)

### 4 PAGE CONTINUATION BOOKLET

Write the information required clearly in the boxes above using capital letters.

Question Part

9	they can also cause long term issues for a performer. The nutritional acid bicarbonate can be used to increase the buffering capacity of blood. This will then reduce fatigue and lactic acid accumulation. This will then aid recovery as less lactic acid <del>has</del> will result is shorter slow lactacid component. Creatine supplementation can increase stores of phosphocreatine which can then be used in the ATP-PC energy system. This will aid recovery as it will mean that more ATP can be resynthesised during exercise which will then reduce EPAC. However, creatine supplementation can lead to increased
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This document consists of 4 pages



Question Part

mass and water retention. Also bicarbonate can ~~increase~~ cause gastrointestinal problems and doesn't prevent the production of lactic acid and therefore impact on recovery is reduced.

Another nutritional aid is carbohydrate loading which can be used before an event to increase the stores of glycogen <sup>in body</sup>. This glycogen can then be used in glycolysis. However, this will have little impact on removal of lactic acid as if oxygen is not present anaerobic respiration will occur ~~use~~ independent of glycogen stores. However, glycogen can be used to fuel aerobic activity which would then aid energy. Consumption of glucose after an event will aid recovery. Furthermore ~~the~~ cooling techniques can be used to aid recovery such as water baths which aid in removal of lactic acid. Also heat can be applied to cause vasodilation to flush muscles with oxygen which will aid recovery. Massages can also be used to aid recovery with the ~~removal of~~ breaking down of accumulated lactic acid. Therefore, to conclude as a coach



Question Part

can use a range of strategies in order to aid recovery of an athlete both before, during and after training. Ergogenic nutritional aids can aid in recovery, such as massages and post exercise consumption of glucose. However, some nutritional aids will have little impact on recovery.



