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Introduction

These exemplar answers have been chosen from the summer 2018 examination series.

OCR is open to a wide variety of approaches and all answers are considered on their merits. These exemplars, therefore, should not be seen as the only way to answer questions but do illustrate how the mark scheme has been applied.

Please always refer to the specification https://www.ocr.org.uk/Images/234833-specification-accredited-a-level-gce-physical-education-h555.pdf for full details of the assessment for this qualification. These exemplar answers should also be read in conjunction with the sample assessment materials and the June 2018 Examiners' report or Report to Centres available from Interchange https://interchange.ocr.org.uk/Home.mvc/Index

The question paper, mark scheme and any resource booklet(s) will be available on the OCR website from summer 2019. Until then, they are available on OCR Interchange (school exams officers will have a login for this and are able to set up teachers with specific logins – see the following link for further information http://www.ocr.org.uk/administration/support-and-tools/interchange/managing-user-accounts/).

It is important to note that approaches to question setting and marking will remain consistent. At the same time OCR reviews all its qualifications annually and may make small adjustments to improve the performance of its assessments. We will let you know of any substantive changes.
Question 1

Define what is meant by ‘acclimatisation to high altitude’ and state one sporting activity in which performers would benefit from it. [2]

Exemplar 1 2 marks

Exemplar 2 2 marks

Examiner commentary

Examiner commentary

Candidates were required to define what is meant by high altitude. This is a good example of candidate who identified the fact that ‘high altitude’ meant a LOWER pressure (partial) or Oxygen in the air or some reference to change in environment. A repeat of the question was common ‘getting used to altitude’. This was not accepted. This candidate included a distance event as an example. Team games with aerobic elements were also accepted.
Question 2

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

Exemplar 1

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

ATP provides energy for short burst usage. As a result, plays a major role due to providing the energy for the smash. [2]

Examiner commentary

This candidate managed to access both marks; short burst of energy for powerful usage, ‘high energy’ movement are both good for points 1 and 2.
Question 3

Identify two types of spin and the effect of each on a table tennis ball in flight. [2]

Exemplar 1

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

- **Topspin**: This would result in the ball dropping shorter than it’s normal flight path and cause it to drop off the table. [2]
- **Backspin**: This results in the ball travelling further than it’s normal flight path and causes the ball to deviate. [2]

Examiner commentary

This candidate accessed both marks for identifying both topspin and backspin and the effects ‘ball dropping shorter than normal’ and ‘ball travelling further than its normal flight path’.

Exemplar 2

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

- **Backspin**: Increases the distance travelled by the ball. [2]
- **Topspin**: Shortens the distance travelled by the ball. [2]
- **Hook**: Causes the ball to deviate to the left. [2]
- **Slice**: Causes the ball to deviate to the right. [2]

Examiner commentary

This candidate mentioned hook and slice causing the ball to deviate. However the hook and slice are the effects of the type of spin applied, not the actual application of force itself so the candidate was unable to gain any marks.
Question 4

Compare explosive strength and strength endurance. [2]

Exemplar 1 1 mark

Compare explosive strength and strength endurance.

Examiner commentary

For this question candidates were required to make direct comparisons for each point. KU was marked for individual points followed by a tick when the comparison was reached. Comparative language like ‘slower’ was accepted as well as sporting examples clearly using the type of strength identified. This candidate included ‘explosive strength’ having ‘maximum force’ and ‘series of contractions’. For strength endurance they gained the comparative mark for ‘sustain muscular contractions’ but the withstand fatigue came from the same point on the mark scheme so a second mark was not accessed.

Exemplar 2 0 marks

Compare explosive strength and strength endurance.

Examiner commentary

This candidate was vague in the description of ‘large force in a short time’ for explosive strength. This required ‘maximal force and one or series of contractions’ from the mark scheme. Both descriptions of muscular endurance were also too vague.
Question 5

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

Exemplar 1

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

...shows a person's gait and this can be modified to improve a runner's technique and allow them to be quicker.

Examiner commentary

This question's answers were divided into 4 categories: technology, assessment, technique and injury. Opposites were acceptable (ie identify poor technique). This candidate mentioned the limb kinematics shows a person's gait, however we needed 'assessing gait' to hit the mark. Showing was too vague. They did gain marks for considering that 'gait' can be modified for point 3 on the mark scheme.

Exemplar 2

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

Limb kinematics use mechanics to track movement... in the execution, execution and recovery so can enhance biomechanical efficiency, joint movement and balance to create more effective movements to enhance performance.

Examiner commentary

This candidate accesses point 2 for 'enhancing biomechanical efficiency'. 'Enhance performance' was too vague to hit marks for point 3 on the MS about improving technique.
**Question 6(a)**

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

![Netballer preparing to shoot](image)

**Fig. 1**

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

<table>
<thead>
<tr>
<th>Joint type</th>
<th>Articulating bones</th>
<th>Plane of movement</th>
<th>Movement</th>
<th>Agonist</th>
<th>Antagonist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Exemplar 1  

<table>
<thead>
<tr>
<th>Joint type</th>
<th>Articulating bones</th>
<th>Plane of movement</th>
<th>Movement</th>
<th>Agonist</th>
<th>Antagonist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carpals</td>
<td>Ladiis</td>
<td>Sagittal</td>
<td>Extensor</td>
<td>Nis ext</td>
<td>Nis flex</td>
</tr>
</tbody>
</table>

**Examiner commentary**

A good answer. Once the candidate identified the correct movement the antagonistic pair were easy to access.
Exemplar 2

<table>
<thead>
<tr>
<th>Joint type</th>
<th>Articulating bones</th>
<th>Plane of movement</th>
<th>Movement</th>
<th>Agonist</th>
<th>Antagonist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinge</td>
<td></td>
<td>Sagittal</td>
<td>Flexion</td>
<td>Wrist</td>
<td>Wrist, et al.</td>
</tr>
</tbody>
</table>

Examiner commentary

This candidate accessed the articulating bones and plane of movement, but failed to identify the movement leading to errors in identifying the antagonistic pairs.

Exemplar 3

<table>
<thead>
<tr>
<th>Joint type</th>
<th>Articulating bones</th>
<th>Plane of movement</th>
<th>Movement</th>
<th>Agonist</th>
<th>Antagonist</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball &amp; socket</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</table>

Examiner commentary

This candidate failed to hit any points on the mark scheme and identified the incorrect movement at the wrist.
Question 6(b)

Explain what the energy continuum is and justify the position of one sporting activity on the energy continuum. [4]  

Exemplar 1

3 marks

Energy continuum is a line linking up the ATP-PC, glycolytic system and the aerobic system, and the activity is based on the closest to which the energy system it predominantly uses during performance. For example, a 5000m runner would mainly use the aerobic system for 99% of the race as it’s not at high intensity and is greater than 3 min duration. However, in the last 100m of the race for a sprint finish the ATP-PC system may be used during this explosive sprint. [4]

Examiner commentary

A good answer. The question required an example and a justification of the example for the AO2 and AO3 marks. This candidate accessed point 1 for giving the fact that the energy continuum identified the ‘predominant’ system in use. The example of the 1500m runner being 99% aerobic gained point 3. They also accessed point 4 for the 100m at the end of the race being ATP/PC for an explosive sprint. It was thought that they hadn’t done enough to gain the mark about intensity and duration.

Exemplar 2

0 marks

The energy continuum is a scale used to place sports based on the demand for energy. For example, a sport such as boxing has a short demand much energy as a result would lower at the scale. However, a sport such as basketball due to the amount of aggression and defensive with limited breaks at a higher intensity makes... [4]

Examiner commentary

This candidate mentioned the continuum being a ‘scale’. This was a common error. They then mentioned low energy use at one end and high energy use at the other end. Therefore not specific enough to gain any marks.
Question 6(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.

Exemplar 1

Examiner commentary

The opening sentence sets the scene without reaching any points as yet. In the guidance for examiners ‘arteries’ were accepted for arterioles. Thus this candidate hits the points of the mark scheme for both pre-capillary sphincters and arteries. However, the full marks were only gained when the candidate identified the blood being redistributed to the muscles ‘predominantly in the legs’.
Exemplar 2

At rest, 80% of blood goes to the organs and 20% to the muscles. The arterioles and pre-capillary sphincters vasodilate to the vital organs and vasoconstrict to the muscles. During exercise, roles reverse. 20% of blood goes to the working muscles and 80% to the vital organs. The arterioles vasodilate to the working muscles and vasoconstrict to the vital organs. This happens because as the cyclist begins cycling the muscles are utilising oxygen and therefore start to demand more causing there to be a redistribution of blood.

Examiner commentary

A key point in this question was reference to the cyclist. Therefore, candidates needed to include information about ‘working muscles’ or ‘leg muscles’ having more blood distribution. ‘Muscles’ on their own was deemed to be too vague. This candidate accessed marks for arterioles vasodilating to working muscles and vasoconstricting to organs. They also managed to access the marks for why because the muscles ‘demand’ more oxygen.

Exemplar 3

The vascular shunt redistributes blood to the working muscles through vasodilation and vasoconstriction. Before the start of the event, the athlete is stationary and most of the blood is distributed to the organs. However, when the race starts, the muscles start working and the vascular shunt mechanism ensures that more blood is distributed to the working muscles rather than the organs. Blood is distributed to: the heart, to ensure oxygen is delivered to the skin, to regulate temperature and working muscles, for example, the rectus abdominis.

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Examiner commentary

This candidate clearly remembers very little about the details of the vascular shunt mechanism apart from the fact that there is vasoconstriction and vasodilation. What blood vessels it affects is clearly not understood so the answer is repetitive, vague and in places largely irrelevant.
Question 6(d)(i)

Describe the mechanics of breathing which cause inspiration at rest. \[3\]

Exemplar 1

Exemplar 2

Examiner commentary

Examiner commentary

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Describe the mechanics of breathing which cause inspiration at rest:

Due to the oxygen debt paid during an activity,

during rest the mouth widens, the lungs open up, the diaphragm contracts to increase the

intra-abdominal pressure area. This allows for greater inspiration due to increased surface area of the osophagus

in lungs, allowing for greater inhalation. [3]

Examiner commentary

This candidate knows the diaphragm is involved but thereafter the answer is a hopeful shot in the dark.
Examiner commentary
Only 3 marks on the mark scheme to do with efficiency, adaptations and the frequency of breathing. This candidate achieved point 1 for more efficient at utilising the oxygen.

Examiner commentary
Like many this candidate only gained marks for the lower breathing rate.
Question 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.

Exemplar 1 3 marks

Blood doping is where blood is removed from the body 5 weeks prior to the event and frozen. During this time, the body produces more red blood cells and the cells re-enter the body before the event. The frozen blood is then injected back in increasing red blood cell count. A physiological benefit includes an increase in red blood cell count. A potential risk is due to increased red blood cell count, this would lead to a blood clot.

Examiner commentary

3 marks on the mark scheme for a 3 mark question. For point 1 candidates had to include the fact that the blood is removed AND reinjected for the mark. The vast majority of candidates gave increased red blood cell count / density for point 2 risks varied from blood clots to infections from needles and heart attacks. This candidate accessed all 3 points.

Exemplar 2 2 marks

An athlete would train at altitude and adaptations would occur, eg increased number of red blood cells. Blood would then be taken out of the athlete and stored until before a race, where it then put back in.

Examiner commentary

The candidate managed to get point 1 although put in layman’s terms. Point 2 fine by point 3 a bit vague with ‘diseases’ transmitted through needles. We needed infections to be specific.
Question 7(b)(i)

A dislocated shoulder in rugby is an example of an acute sporting injury.

(i) Compare acute and chronic injuries. [2]

Exemplar 1 2 marks

Acute injuries are as a result of a traumatic event and... [BOD KU] e.g. fracture... happen at that time. Chronic injuries are overuse injuries... that occur progressively over time e.g. runners' heel. [2]

Examiner commentary

Good succinct answer. Clear identification of acute being a 'trauma' and chronic 'overuse'. Happening at that time and progressively over time were clear enough comparisons for the time-frame.

Exemplar 2 1 mark

Acute injury happen suddenly... whilst chronic injuries occur over a longer period of time. [BOD KU]

Examiner commentary

This candidate was marked with a KU at 'sudden' and mark was given for the comparison at 'long period'. No attempt made for cause of chronic injury although they managed 'trauma' for acute.

Exemplar 3 0 marks

Acute injuries happen in a very short period of time whereas chronic injuries happen over long periods of time. [2]

Examiner commentary

Candidates were required to make direct comparisons to access the marks. While this candidate did make a direct comparison, 'short' and 'long' periods of time were seen as too vague.
Question 7(b)(ii)

Apart from dislocation, give a sporting example of an acute injury and a chronic injury. [1]

Exemplar 1 1 mark

Acute - Fracture, broken leg, from a bad tackle in football. [KU]
Chronic - Tennis Elbow, overuse of the elbow over a period of time. [1]

Examiner commentary
Candidates were required to give a particular situation from a sport to gain the marks. This candidate did well mentioning the bad tackle in football for the fracture and tennis elbow being overuse over time.

Exemplar 2 0 marks

............................................................... (tens... tennis elbow)

Concession: acute = fracture [TV]

Examiner commentary
Clearly no example from sport so no marks.
Question 7(b)(iii)

Outline the correct medical treatment a sports coach should apply to a dislocation injury. [3]

Examiner commentary

Three key points regarding the medical treatment for a dislocation were needed. Many candidates used the acronym SALTAPS, which was not appropriate, or PRICE, which if elements were unexplained was too vague. The strongest answers considered the need for medical attention, immobilisation and pain medication.

Exemplar 1 2 marks

Protection: Stop the injury from getting worse.
RICE: Rest the injured area to reduce further injury.
Ice the area to reduce swelling.
Compression on the area to reduce swelling.
Elevation to reduce bloodflow and swelling.

Examiner commentary

This candidate accesses point 2 on MS for protection. Although they mention PRICE they gain the mark for saying what the aim of applying ice would be.

Exemplar 2 0 marks

The should apply ice on the area.
Apply compression as well as elevation.

Examiner commentary

This candidate clearly goes down the PRICE route mentioning ice compression and elevation. The mark scheme requires a 'reason' for applying ice (reduce swelling) which this candidate missed. Compression and elevation not appropriate for a dislocation.
Question 7(c)(i)

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

(i) Describe the factors affecting flexibility that enable the gymnast to perform the splits. [3]

Examiner commentary

An applied question to the illustration of the gymnast. Candidates were required to describe the factors affecting flexibility that enabled the gymnast to perform the splits therefore there was a positive context required in the answer. Candidates often focused on the negative with statements such as; with increasing age flexibility decreases, yielding no marks. More successful answers considered the ball and socket joint, greater elasticity of connective tissues and young age leading to greater range of motion at the hip joint.

Exemplar 1 2 marks

Age → as age increases, flexibility decreases...

Length of surrounding tissues → the longer they are, the more flexible you are.

eg. groin warm up → if the gymnast has performed a good warm up, the temperature of the muscle increases leading to a wider range of motion in the hip... [3]
Examiner commentary

The candidate accessed point 2 for 'length of surrounding tissue' with explanation then 'temperature' from warm up leading to wider range of motion.

Exempler 2

1 mark

Age is a factor as you get older your lever love.

Your flexibility due to less bandwidth around the joint.

Training allows for the gymnast to undergo adaptable which will help because their flexibility gender is also a factor as women are usually more than flexible than men due to less muscle mass leading to a wider range of movement around joints, thus non-stiff.

Examiner commentary

The candidate accessed the mark for training which means the gymnast undergoes adaptations, however the remainder was vague comments about age and gender which don't relate to the young male gymnast in the figure.
Question 7(c)(ii)

Describe two adaptations from training that have enhanced this gymnast’s flexibility by increasing the range of motion at the hip joint.

[2]

Exemplar 1

2 marks

Examiner commentary

A good answer. More elastic connective tissue and decreasing stretch reflex both accessed.

Exemplar 2

0 marks

Examiner commentary

All quite vague based around lubrication and injury prevention.
Question 7(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.

Examiner commentary

A 6 mark question requiring a four mark HIIT training session for aerobic capacity and two marks for its effectiveness over continuous training. Most candidates scored with a general description of HIIT training and appropriate examples, higher ability candidates offered time scales, work: relief ratios and intensity. Few candidates scored full marks as many focussed on HIIT being more effective due to psychological reasons such as prevents boredom or maintains motivation rather than the physiological reasons required.

Exemplar 1 5 marks

HIIT session for aerobic capacity would include periods of work and periods of rest. The period of work would be of a relatively high intensity (80%-85% VO2max) for 3 mins and the rest intervals would be at 75-55% of VO2max at a ratio of 1:1:1:05 for acute recovery. HIIT is more effective as it is working at a higher intensity than continuous so puts more strain and adaptations on the lungs and heart causing a more efficient hypertrophy of lungs and cardiac. This also uses the upper end of the aerobic capacity zone tested by the HR(VO2max-T10-age) so there are more adaptations.

Examiner commentary

A good answer. Work-relief ratio, work intensity and duration all accessed. Point 1 accessed with a KU link between first 2 sentences. More adaptations accessed point 10 for comparison.
High intensity interval training involves short periods of high intensity drills for short periods of time. It is used to improve explosive strength and can also be used to improve aerobic capacity. An example would be 10 sets of 400m sprints with 2 minutes inbetween each set. It is more effective than continuous training as it is more time-effective and also creates results quicker.

Examiner commentary
A succinct answer. No. of sets, type of training and rest duration all accessed. Point 12 also accessed for being more ‘time-effective’ than other training.
A... high... intensity... interval... training... involves... the... use... of... intervals... for... rest... breaks... and... periods... of... short... high... intensity... activity...

A... HIIT... session... can... involve... a... low... amount... of... sets... and... repetitions... of... 400m... running... but... at... an... 80%... of... high... intensity... rate... By... doing... this,... the... performer... will... work... at... high... intensities... of... aerobic... and... anaerobic... rates... enabling... aerobic... capacity... to... be... improved...

... one... reason... why... HIIT... is... considered... more... effective... than...

-continuous... training... is... because... it... is... at... a... higher... intensity...

Continuous... training... is... low... to... moderate... intensity... Another... reason...

why... HIIT... is... considered... more... effective... than... continuous... training...

is... because... it... has... rest... intervals... This... allows... the... body... a... short... period... to... adapt... before... high... intensity... work... is... started... again... This... is... more... effective... in... improving... aerobic... capacity... than... continuous... training.

Examiner commentary

Intervals for rest breaks and short high intensity activity was a little confusing as the interval is normally the active part. There was no detail for numbers of sets or reps or the intensity however the candidate accessed point 3 on the m/s for 400m running, 80% of high intensity rate was TV for level of exertion. The comparisons were a bit wordy eventually accessing the mark for identifying more effective in improving aerobic capacity for point 10 on more adaptations.
Question 8(a)
Define Newton’s third law of motion and apply it to a sporting example of your choice. [3]

Examiner commentary
One mark available for a definition of Newton’s third law of motion and two marks for its application to a sporting situation. Generally answered well with good definitions and application largely to either a sprint start (between the foot and the blocks) or kicking a football (between the foot and the ball). Candidates failed to score if they did not consider the equal and opposite nature of the forces.

Exemplar 1

Examiner commentary
A good clear definition with clear indication of the forces acting for action and reaction.

Exemplar 2

Examiner commentary
Another good definition with an example of reaction. The candidate slightly misunderstands the concept and thus the reaction force is incorrectly identified.
Newtons’ third law is the law of Action/Reaction. It states that for every action there is an opposite and equal reaction. For example, in basketball when a player jumps to shoot they exert a force onto the ground and an equal and opposite force is exerted from the ground, enabling the player to jump.

Examiner commentary

Another good definition with an example of reaction. This is a good example of a candidate not going quite far enough to clarify reaction force in their example.
**Examiner commentary**

Candidates were required to identify the two lever systems that operate at the elbow joint, describe the component order and give a practical example.

**Exemplar 1**

3 marks

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

Examiner commentary

This candidate gains marks for identifying the third class being a bicep curl and the order in the margin is also given for the order of a first class lever system. The first class system is given for extension of the elbow.
Exemplar 2

1 mark

Examiner commentary
This candidate has the wrong lever for bicep curl but manages to get the correct order for first order lever so accesses point 2 on ms.

Exemplar 3

0 marks

Examiner commentary
The basic concept was that a tricep extension movement is a first class lever whereas a bicep curl is a third class lever as the order of the load, effort and fulcrum are different.

This candidate confuses the type of lever for the bicep curl and fails to clearly identify the order. The remainder is clearly vague.
Question 8(b)(ii)

Calculate the moment of inertia during a biceps curl, given a total mass of 10kg at a perpendicular distance \( r \) of 0.5 metres from the weight to the fulcrum. Show your workings. \[2\]

Examiner commentary
The correct calculation and answer with the correct units was required for two marks. Many candidates multiplied the two figures provided which did not gain credit.

Exemplar 1

Incorrect equation because the candidate fails to square the 0.5.
Question 8(c)(i)

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

(i) Explain the shape of the graph, with reference to the tucked somersault, from A to B. [3]

Examiner commentary
Candidates were required to explain the shape of the graph with specific reference to the tucked somersault from A to B for three marks. If candidates used point A and point B they were likely to gain credit compared to a general description of the whole graph.

Exemplar 1 3 marks

The shape of the graph is a helix shape. At point A, the somersault is half way through its movement. Due to the somersault being tucked, angular velocity is high and moment of inertia is low. At point B, the somersault is at its landing stage and therefore, limbs will be distributed away from the centre of mass. Moment of inertia is high and angular velocity is low.

Examiner commentary
A good answer. The candidate clearly identifies point A and describes the relationship between moment of inertia and angular velocity. Point B again identified, with indication of the position of the limbs and the changed relationship between MOI and AV.
Before the somersault, the performer has a higher moment of inertia than angular velocity. During the somersault, the moment of inertia decreases and then it returns to the same level it was at the start. The opposite happens to the angular velocity and it is inversely proportional to the moment of inertia. The angular momentum is the product of the two.

Examiner commentary

This candidate confuses the whole concept and doesn't follow the graph accurately enough and thus is either irrelevant in places or too vague.
Question 8(c)(ii)

Explain, using the angular analogue of Newton’s first law of motion, the concept of conservation of angular momentum. \[3\]

Examiner commentary

Three marks available for the correct description and application of the angular analogue of Newton’s first law of motion. A less well answered question due to the lack of clarity in candidate’s answers regarding angular terminology. Many candidates used Newton’s first law of motion rather than its angular equivalent with ‘angular momentum’ and ‘torque or eccentric force’.

Exemplar 1 3 marks

Explain, using the angular analogue of Newton’s first law of motion, the concept of conservation of angular momentum.

Newton’s first law of angular analogue states “a body will sit... to rotate about an axis of rotational inertia... angular momentum... unless acted upon by an external torque. This relates to conservation of angular momentum... as this is a constant of angular velocity... and... an object generally... angular moment at the start... it can not be changed until the landing of... object.”

Examiner commentary

A good answer with reference angular momentum and external torque.
Exemplar 2

Examiner commentary

Candidates needed to explain how a body will continue with its angular momentum unless it is acted on by an eccentric force or give the equation. This candidate was vague in all aspects.
Exemplar 1 2 marks

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

Examiner commentary

A good answer with direction of movement clearly opposed by air resistance. AR and Weight clearly from centre of mass of the object.
Exemplar 2

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

Examiner commentary

Weight and Air Resistance clearly from centre of mass of the object but no direction of travel indicated so only 1 mark.
Question 8(d)(ii)

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

Exemplar 1

3 marks

Examiner commentary

A well-constructed diagram. Weight and AR from CofM of ball. Clear parallelogram with arrows pointing in the correct direction and the dotted lines making up the sides of the parallelogram.
Examiner commentary

An example of a candidate overcomplicating the diagram.
Question 9

9* A team game such as basketball provides opportunities for recovery from high intensity work both during and after the match.

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]

Examiner commentary

Candidates were required to show knowledge and understanding of the alactacid component of recovery, a range of strategies used to maximise recovery and an evaluation of nutritional strategies to aid the recovery process. In the evaluation of nutritional strategies, it was expected for candidates to consider both the benefits and side effects of use.

Exemplar 1 16 marks

A team game, such as basketball, provides opportunities for recovery from high intensity work both during and after the match.

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.

After high intensity exercise such as basketball, there is a high oxygen deficit caused by use of the anaerobic energy systems including the ATP-PC system and glycolytic system which doesn’t use as much O2 as required.

This oxygen deficit can be reduced by excess post oxygen consumption during recovery. In the first 3 minutes...

The fast alactacid component replenishes the blood and muscles of oxygen by...
Keeping the breathing rate elevated to increase O$_2$ intake to continue haemoglobin association with O$_2$ and returning H$^+$ from myoglobin helps. It also resynthesizes the ATP-PC system completely as 50% is restored within 30 seconds and 100% restored in 3 minutes. This occurs by a condensation reaction using ATP synthase to restore the ATP phosphate bond and to restore phosphagen and creatine. Whilst the fast anaerobic component of recovery occurs, the slow lactacid component of recovery takes place to continue ventilation and circulation to meet the demands of the muscles and to remove CO$_2$ as waste, carbonic acid, and carbonic anhydrase. It is also regulated temperature by as for every 1°C of body temperature increase, there is a 15% rise in metabolic actions which increase enzyme activity to break down lactate, acid, and other waste products. It also removes lactate acid by oxidizing it in the mitochondria so it returns back to the Krebs cycle and electron transport chain to return to CO$_2$, H$_2$O, and energy. It also converts it to glucose through gluconeogenesis and to glycogen by glycogen synthesis to replenish glycogen stores. Lastly, a small amount is converted to a protein by the Citric Acid Cycle in the liver.
In a basketball game, a coach can maximise recovery by using a variety of techniques. This can include during the game such as using half-cuts and substitutes to replenish ATP-PC stores (30 secs to replenise 50% and 3 mins to replenish 100% of ATP-PC stores). The coach can also use tactics within the game such as zone defence, which is less intense so was more of the game.

Aerobic systems which use $O_2$ and reduces oxygen deficit and lactic acid production, so recovery is quicker and players become less fatigued.

After the basketball game, the coach could use an appropriate cool down to maximise recovery. This should include an active cool down at $75-80\%$ of VO$_2$ max to increase oxygen supply to the muscles to prevent pyruvate being converted into lactic acid by lactate dehydrogenase. This will also maintain the inverse gradient of pO$_2$ and pCO$_2$ in intracellular respiration, the alveoli, and capillaries to prevent blood pooling which can cause cramps. It is...
Each should then incorporate stretching after the warm-up cooling such as PNF stretching to relax the muscles and vasodilate them to increase blood flow to remove toxins, lactic acid and waste products.

The coach should also use electrolyte drinks to replenish minerals and salts (electrolyte) lost through sweating as this can cause dehydration which reduces blood volume and decrease performance as well as not flushing out lactic acid. He should use an isotonics (same glucose concentration) during and after the game to replenish glucose stores for energy and rehydrate as isotonics drink are absorbed at the same rate. Then later on after the game a hypertonic drink should be consumed to replenish your blood glucose levels as this has a higher concentration of glucose than in the blood.

The coach could also use cooling techniques to reduce blood flow to areas due to vasodilatation to reduce pain and swelling. Heat therapy can also be used to increase blood flow...
Numerical ergogenic aids include caffeine, creatine, bicarbonate, and nitrate. Caffeine isn’t useful in learning but creatine can be used before a game to increase muscle blood flow, for the body system to provide high energy contractions. However, this can lead to water retention in muscle, which can cause weight gain, this also means cramps, kidney, the muscle may occur. Bicarbonate is used in recovery as they act as a buffer to increase buffering capacity so is able to reach and release lactic acid—this can lead to an increase in intensity and duration of high-intensity exercise. Before QBLA (Level of blood lactate accumulation) occurs. However, this can lead to gastrointestinal problems and cause nausea. Nitrates are contained within the body as nitric oxide and are used to make proteins and DNA with cyanide in cells (Humans). They also can be used as a nutritional...
Examiner commentary

This candidate did an extremely comprehensive analysis of the processes occurring in the first stage of recovery. From restoration of the oxy-myoglobin links to the replenishment of ATP/PC system they were able to incorporate highly technical language and link with some other areas of the physiology course, namely glycolysis. They were also able to identify the fact that a small amount of the Lactic Acid recovery process will have taken place during the first 3 minutes of exercise.

The candidate chose basketball as their team sport, identifying time outs, substitutions and the use of certain tactics to allow time for recovery. They also included an active cool down and some of the physiological processes that are maintained as a result of the continued levels of exercise.

Finally they evaluated nutritional ergogenic aids that help with the recovery process. ‘Isotonic’ and ‘hypertonic’ drinks were mentioned as well as caffeine, creatine, bicarbonate and nitrates with some development on what they actually did to enhance the recovery process.

While overall this was a very comprehensive answer and the candidate went into significant detail in many areas, particularly the physiological aspects of recovery, it was felt that there was not sufficient evaluation in the strategies and ergogenic aids to push them into the top band. There was a brief mention of tactics but no real indication of how this would be achieved on the basketball court so the application to the game was a little weak. The candidate did offer some negatives for the use of the ergogenic aids but they didn’t balance with the positives.

This is a good example of a band 4/3 borderline answer. It could well have squeezed into the top band, particularly with such an accomplished first section. However, the middle section, where application to sport was important, just pulled it into the lower band.
Exemplar 2

10 marks

9* A team game such as basketball provides opportunities for recovery from high intensity work both during and after the match.

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. Carbs loading

Plan

1 = Alactacid recovery = restoration of oxygen supply in myoglobin (muscles) and in blood using fats.

2 = Hockey

Eccentric exercise = not to cad. (Adapt + disocou)

Cool down = stretching (dynamic + static)

Compression wear

Massage = legs, muscles (good + bad)

In the first three minutes following exercise, the recovery is caused alactacid and it focuses on replenishing things used oxygen in the blood and myoglobin stores and uses fats to help aid muscle recovery of the diaaphragm or intercostals. It does this mainly by keeping your heart rate and cardiac output elevated out also your tidal volume and breathing frequency which allows the oxygen deficit to decrease. Excess post-
Exercise oxygen consumption is important to restore levels in the blood and muscles and it also helps remove carbon dioxide. Carbon dioxide is removed as carbonic acid in the blood plasma or as carbaminohaemoglobin in the red blood cells. During recovery after exercise, prepare the body for the lactacid stage which occurs after 3 minutes and wonder the cool cycle. Lasting 10-20 minutes.

In hockey, a cool down is vital after training as it aids things like reducing domi in the subsequent days or reduces the chance of injury when next playing. Both a coach and player should ensure that a cool down is taken place, both dynamic and static stretching should be performed as well as a slow jog around the pitch to help keep your heart elevated and remove CO₂. A cool down is vital for recovery to maximise recovery. A player can also take part in cryotherapy.
sessions. This is when a player goes from a hot barn or snare to a cold barn or snare. Benefits of doing this include; as you move from one end to another your arteries and capillaries vasodilate and vasconstrict which increases blood flow allowing for oxygen to get and to repair your muscles but also to get all of the CO₂ and lactic acid out. This is good as it reduces muscle soreness (cans) which allows for a good performance in the following days. On the other hand, cryotherapy can lead to skin burns and blisters if either temperature is too extreme so some caution must be taken. This can also be expensive so not very accessible.

Another strategy that can maximise recovery is compression wear. This is when tight bandages or supports are placed around muscles, this reduces blood flow allowing for little swelling to occur. In hockey,
Compression wear can be used on your legs, e.g., gastrocnemius, as these are the muscles mostly used. However, compression wear has its disadvantages—for example, if too tight, it will restrict blood flow to the muscles and they won’t be repaired as no oxygen will reach it.

Finally, a coach can encourage players to get massages. Massages are good as they can lengthen and warm your muscles and reduce any tightness in them. For example, in hockey, your back or leg muscles can become stiff due to overuse, this will reduce flexibility and lead to a decrease in performance. Massages aren’t good because they can be expensive if they’re not supplied by a club. However, if they are, it’s an excellent aid to help recovery. On the other hand, they are a passive form of recovery which doesn’t aid the muscle as much as a cool
An example of a nutritional ergogenic aid is **carbohydrate loading**. As you are reading up to a match (up to one to two weeks before hand), you decrease your intake of carbohydrates. Then, a day before the event, you eat a diet very high in carbohydrates. This allows your carbohydrate stores to be full and ready. It is good because it means there is more fuel for aerobic respiration. However, this is only useful for events that use aerobic respiration, e.g., 5,000m or before a hockey match. It's not as useful for someone who's predominant energy system is anaerobic, or relies on **lactic acid**.
This candidate began well with some useful information about replenishment of oxygen in the myoglobin but failed to include the more significant role in replenishing ATP/PC stores. They included some largely irrelevant information about raised heart rate and tidal volume which related back to the myoglobin replenishment. The second part of the question was answered with the cool down initially. The information about the cryotherapy was largely inaccurate or vague but did have some useful information about effects on the vascular system. Compression wear and massages gave this section a little more meat than the first. The first 3 minutes of recovery, use of nutritional ergogenic aids included carbo-loading and creative supplements with some reasons for their use but with no effective evaluation. There was a high ratio of AO1 in the answer and they never really developed any of the 3 sections effectively. It was good enough for Level 2 with enough information to get near the top of the level. However, this is a good example of a candidate who writes in volume but fails to really address the major parts of the question effectively.
After the first five minutes of exercise, some recovery processes are initiated due to oxygen debt. The body will inhale larger amounts of oxygen to help supply the working muscles with extra post-exercise. Another recovery process is hydration. Athletes will hydrate themselves with either water or very sugary drinks such as gels or drinks. This helps give the body an extra supply of glucose to help sustain the requirements of the body which has lost sugar levels during exercise, ensuring the body is functioning at optimum levels.

In football, some coaches use ice baths to help improve the recovery process. This reduces favour in muscles and the cold compresses help to numb any bruising or bumps endured during exercise in football matches.

Some coaches also use massages, which directly remove lactic acid in muscles as well as reduce muscle pain.
Examiner commentary

This candidate struggles with the concept of recovery. A brief incorrect description of how inhalation helps to repay oxygen debt during the first 3 minutes of exercise is incorrect. The candidate then includes ‘hydration’ as a recovery process. This would have probably merited more marks if it was in a different part of the answer. The strategies included ice baths however the reason for using ice baths was incorrectly identified, reducing tension and numbing bruises are not reasons for post competition ice baths. Massages were also mentioned as well as post match diet high in protein. Not only was this a poorly constructed essay it emphasised the gaps in the candidates knowledge rather than give hints at what they did know. This was mainly AO1 content and hardly really addressed any of the 3 main parts of the question and thus was a low Level 1 answer.
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