

**OCR**

Oxford Cambridge and RSA

**A Level Physical Education**

**H555/01 Physiological factors affecting performance**

**MARK SCHEME**

**Duration: 2 hours**

**MAXIMUM MARK 90**

**This document consists of 20 pages**

## MARKING INSTRUCTIONS

### PREPARATION FOR MARKING SCORIS

1. Make sure that you have accessed and completed the relevant training packages for on-screen marking: Scoris Assessor Online Training; OCR Essential Guide to Marking.
2. Make sure that you have read and understood the mark scheme and the question paper for this unit. These are posted on the RM Cambridge Assessment Support Portal <http://www.rm.com/support/ca>
3. Log-in to scoris and mark the 10 practice responses (“scripts”) and the 10 standardisation responses

YOU MUST MARK 10 PRACTICE AND 10 STANDARDISATION RESPONSES BEFORE YOU CAN BE APPROVED TO MARK LIVE SCRIPTS.

### MARKING

1. Mark strictly to the mark scheme.
2. Marks awarded must relate directly to the marking criteria.
3. The schedule of dates is very important. It is essential that you meet the Scoris 50% and 100% (traditional 40% Batch 1 and 100% Batch 2) deadlines. If you experience problems, you must contact your Team Leader (Supervisor) without delay.
4. If you are in any doubt about applying the mark scheme, consult your Team Leader by telephone or the Scoris messaging system, or by email.
5. **Crossed Out Responses**  
Where a candidate has crossed out a response and provided a clear alternative then the crossed out response is not marked. Where no alternative response has been provided, examiners may give candidates the benefit of the doubt and mark the crossed out response where legible.

#### Rubric Error Responses – Optional Questions

Where candidates have a choice of question across a whole paper or a whole section and have provided more answers than required, then all responses are marked and the highest mark allowable within the rubric is given. Enter a mark for each question answered into

RM assessor, which will select the highest mark from those awarded. (The underlying assumption is that the candidate has penalised themselves by attempting more questions than necessary in the time allowed.)

#### Multiple Choice Question Responses

When a multiple choice question has only a single, correct response and a candidate provides two responses (even if one of these responses is correct), then no mark should be awarded (as it is not possible to determine which was the first response selected by the candidate).

When a question requires candidates to select more than one option/multiple options, then local marking arrangements need to ensure consistency of approach.

#### Contradictory Responses

When a candidate provides contradictory responses, then no mark should be awarded, even if one of the answers is correct.

#### Short Answer Questions (requiring only a list by way of a response, usually worth only one mark per response)

Where candidates are required to provide a set number of short answer responses then only the set number of responses should be marked. The response space should be marked from left to right on each line and then line by line until the required number of responses have been considered. The remaining responses should not then be marked. Examiners will have to apply judgement as to whether a 'second response' on a line is a development of the 'first response', rather than a separate, discrete response. (The underlying assumption is that the candidate is attempting to hedge their bets and therefore getting undue benefit rather than engaging with the question and giving the most relevant/correct responses.)

#### Short Answer Questions (requiring a more developed response, worth two or more marks)

If the candidates are required to provide a description of, say, three items or factors and four items or factors are provided, then mark on a similar basis – that is downwards (as it is unlikely in this situation that a candidate will provide more than one response in each section of the response space.)

#### Longer Answer Questions (requiring a developed response)

Where candidates have provided two (or more) responses to a medium or high tariff question which only required a single (developed) response and not crossed out the first response, then only the first response should be marked. Examiners will need to apply professional judgement as to whether the second (or a subsequent) response is a 'new start' or simply a poorly expressed continuation of the first response.

6. Always check the pages (and additional objects if present) at the end of the response in case any answers have been continued there. If the candidate has continued an answer there then add a tick to confirm that the work has been seen.

7. Award No Response (NR) if:
- there is nothing written in the answer space
- Award Zero '0' if:
- anything is written in the answer space and is not worthy of credit (this includes text and symbols).
- Team Leaders must confirm the correct use of the NR button with their markers before live marking commences and should check this when reviewing scripts.
8. The scoris **comments box** is used by your team leader to explain the marking of the practice responses. Please refer to these comments when checking your practice responses. **Do not use the comments box for any other reason.** If you have any questions or comments for your team leader, use the phone, the scoris messaging system, or e-mail.
9. Assistant Examiners will send a brief report on the performance of candidates to your Team Leader (Supervisor) by the end of the marking period. The Assistant Examiner's Report Form (AERF) can be found on the RM Cambridge Assessment Support Portal (and for traditional marking it is in the Instructions for Examiners). Your report should contain notes on particular strength displayed as well as common errors or weaknesses. Constructive criticism of the question paper/mark scheme is also appreciated.
10. For answers marked by levels of response:
- To determine the level** – start at the highest level and work down until you reach the level that matches the answer
  - To determine the mark within the level**, consider the following:

Descriptor	Award mark
On the borderline of this level and the one below	At bottom of level
Just enough achievement on balance for this level	Above bottom and either below middle or at middle of level (depending on number of marks available)
Meets the criteria but with some slight inconsistency	Above middle and either below top of level or at middle of level (depending on number of marks available)
Consistently meets the criteria for this level	At top of level

## 11. Annotations used in the detailed Mark Scheme

Annotation	Description	Annotation	Description
	Tick	<b>KU</b>	Knowledge and understanding / indicates AO1 on Q9
	Cross	<b>EG</b>	Example/Reference / indicates AO2 on Q9
<b>BOD</b>	Benefit of doubt	<b>DEV</b>	Development / indicates AO3 on Q9
<b>TV</b>	Too vague	<b>L1</b>	Level 1 response on Q9
<b>REP</b>	Repeat	<b>L2</b>	Level 2 response on Q9
<b>S</b>	Indicates sub-max reached where relevant	<b>L3</b>	Level 3 response on Q9
<b>SEEN</b>	Noted but no credit given	<b>L4</b>	Level 4 response on Q9
<b>IRRL</b>	Significant amount of material which doesn't answer the question	<b>BP</b>	Blank page

- Sub-maxes are indicated with **S**; the guidance section of the mark scheme shows which questions these are relevant to.
- KU/EG/DEV** used instead of ticks on the extended response question to indicate where knowledge or development points from the indicative content have been made.
- On this extended response question, one KU/EG/DEV does not necessarily equate to one mark being awarded; the marking is based on a levels of response mark scheme which awards a level and mark holistically based upon the quality of the response overall against the levels descriptors.

Section A			
Question	Answer	Marks	Guidance

Section A																			
Question	Answer		Marks	Guidance															
1	Two marks from: 1. Adaptation/ get used to a <b>change</b> of environment/ <b>lower</b> O <sub>2</sub> levels 2. Marathon/ 5000m/ 10,000m runner/ triathlete/ endurance cyclist/ field games e.g. football/ endurance athlete		2 (1 AO1 1 AO2)	DNA 'adapt to high altitude' – REP DNA adaptations to altitude training Credit mainly aerobic egs.															
2	Two marks from: 1. (Duration) ATP breakdown provides energy for immediate need/ up to 2 seconds/ release energy quickly 2. (Intensity) ATP breakdown provides energy for explosive/ powerful/ (very) high intensity		2 (AO2)	Accept: 'quick burst of energy' as point 1 only															
3	Two marks from: 1. <b>Top spin</b> causes ball to dip/ comes down more quickly/ shorter flight path 2. <b>Back spin</b> causes ball to float/ travel further/ longer flight path 3. <b>Side spin</b> causes ball to swerve/ bend/ deviate to left or right/ hook/ slice		2 (AO2)																
4	Two marks from: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th>Explosive strength</th> <th>Strength endurance</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Fast speed of/ elastic <b>contraction</b></td> <td>slow speed of <b>contraction</b></td> </tr> <tr> <td>2.</td> <td>One/ short series of contraction/ movements</td> <td>Repeated/ sustained contractions/ movements over a period of time/ withstand fatigue</td> </tr> <tr> <td>3.</td> <td>Maximal <b>force</b> or type 2b/ FTG fibres</td> <td>Submaximal <b>force</b> or type 2a/ FOG fibres</td> </tr> <tr> <td>4.</td> <td>E.g. sprinting/ jumping/ throwing</td> <td>E.g. rowing/ swimming</td> </tr> </tbody> </table>			Explosive strength	Strength endurance	1.	Fast speed of/ elastic <b>contraction</b>	slow speed of <b>contraction</b>	2.	One/ short series of contraction/ movements	Repeated/ sustained contractions/ movements over a period of time/ withstand fatigue	3.	Maximal <b>force</b> or type 2b/ FTG fibres	Submaximal <b>force</b> or type 2a/ FOG fibres	4.	E.g. sprinting/ jumping/ throwing	E.g. rowing/ swimming	2 (AO2)	Candidate must make comparison for each point KU individual points TICK for comparison Accept comparative language, e.g. 'SE has <u>slower</u> speed of contraction' Credit sporting examples that are clearly using that type of strength specified
	Explosive strength	Strength endurance																	
1.	Fast speed of/ elastic <b>contraction</b>	slow speed of <b>contraction</b>																	
2.	One/ short series of contraction/ movements	Repeated/ sustained contractions/ movements over a period of time/ withstand fatigue																	
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4.	E.g. sprinting/ jumping/ throwing	E.g. rowing/ swimming																	
5	Two marks from: 1. (technology) Video/ motion/ 3D analysis of a sporting action/ movement/ skill/ technique 2. (assessment) Assesses gait/ movement efficiency/ velocity/ acceleration/ joint angles 3. (technique) (Identifies small changes) to improve technique 4. (injury) Helps prevent (repetitive strain/joint) injuries		2 (AO1)	Accept opposites, e.g. identify poor technique															

Section B							
Question		Answer				Marks	Guidance
6	(a)	Six marks for:				6 (AO3)	Mark 1 <sup>st</sup> answer only  N.B. Must identify all 3 articulating bones. 'extensors'/ 'flexors' on own = TV accept extensor carpi radialis etc.
		Joint type	Articulating bones	Plane of movement	Movement		
		Condyloid / Ellipsoidal	Radius, ulna and carpals	Sagittal	(hyper) extension	Wrist extensors	Wrist flexors
	(b)	Four marks for:				4 (2 x AO1 1 x AO2 1 x AO3)	Point 4 refers to the intensity of the <u>action</u> not who the performer is. Could be inferred through answer e.g. 'sprinting' is an action (accept)/ '100m sprinter' is who they are (DNA)
		1. Relative contribution of each energy system (during an activity) 2. Dependent on intensity <b>and</b> duration (of the activity) 3. E.g. Marathon predominantly aerobic <b>or</b> high jump predominantly anaerobic/ ATP-PC system <b>or</b> football 50:50 <b>or</b> hockey player uses all 3 systems 4. (Justification) e.g. 100m sprinter very high intensity or e.g. marathon runner low-mod intensity or e.g. football has elements of high intensity/ sprinting for ball and low intensity/ jogging into position for corner					

Section B				
Question	Answer		Marks	Guidance
(c)		<p>Five marks from:  <b>Sub max 4 marks from HOW:</b>            (how)</p> <ol style="list-style-type: none"> <li>Using vasomotor control/ VCC</li> <li>(Vaso)dilation of arterioles leading to <b>working/ leg/ lower body</b> muscles</li> <li>Opening/ dilation of pre-capillary sphincters to <b>working/ leg/ lower body</b> muscles</li> <li>(Vaso)constriction of arterioles to (non-essential) organs/ muscles of upper body</li> <li>Closing/ constriction of pre-capillary sphincters to (non-essential) organs/ upper body muscles</li> </ol> <p>(why)</p> <ol style="list-style-type: none"> <li><b>working/ leg/ lower body</b> muscles <b>need</b> most/more oxygen/ (oxygenated) blood</li> <li>muscles of upper body <b>need</b> less oxygen/ blood</li> <li>less oxygen/ blood <b>needed</b> at organs/ (non-essential) organs can cope with a (temporary) reduction in blood</li> </ol>	<p><b>5</b> (AO2)</p>	<p>DNA 'contraction' of arterioles</p> <p>Accept arteries or blood vessels for arterioles</p>
(d)	(i)	<p>Three marks from:</p> <ol style="list-style-type: none"> <li><u>External</u> intercostals contract <b>and</b> diaphragm contracts/ flattens</li> <li>upward <b>and</b> outward movement of the rib cage/ sternum</li> <li>This increases the volume of the thoracic/ chest cavity/ space in the lungs</li> <li>Causing a reduction in pressure in the lungs (compared to outside lungs)</li> <li>Gases/ air moves from an area of high to low pressure</li> </ol>	<p><b>3</b> (AO1)</p>	<p>Do not accept: Intercostals on its own.</p>
	(ii)	<p>Two marks from:</p> <ol style="list-style-type: none"> <li>(efficiency) More efficient O<sub>2</sub> utilisation/ gaseous exchange/ diffusion/ oxygen transportation</li> <li>(adaptations) higher RBC/ Hb volume/ capillarisation/ higher mitochondrial density/ increased surface area of alveoli</li> <li>Fewer breaths taken per minute or lower breathing frequency</li> </ol>	<p><b>2</b> (AO1)</p>	<p>Accept aerobic structural adaptations to training</p> <p>DNA stronger respiratory muscles</p>

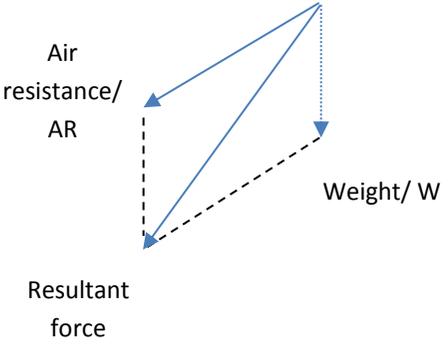
7	(a)	<p>Three marks for:</p> <ol style="list-style-type: none"> <li>(how) blood is <b>removed</b> from athlete, (stored) <b>and re-injected</b> into the athlete (4 weeks later)</li> <li>(benefit) increased RBC/ haemoglobin/ oxygen transport/ aerobic capacity/ lactic acid removal <b>or</b> increased duration/ intensity of exercise <b>or</b> delays fatigue/ OBLA</li> <li>(risk) infections/ hepatitis/ HIV <b>or</b> increased blood viscosity/ blood pressure <b>or</b> decreased cardiac output <b>or</b> blood clots <b>or</b> heart failure/ attack <b>or</b> stroke</li> </ol>	<p><b>3</b> (1 x AO1 2 XAO3)</p>										
	(b) (i)	<p>Two marks for:</p> <table border="1" data-bbox="376 571 1532 756"> <thead> <tr> <th></th> <th>Acute injuries</th> <th>Chronic injuries</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Sudden/ develop quickly</td> <td>Develop slowly/ over a period of time</td> </tr> <tr> <td>2.</td> <td>Caused by a knock/ impact/ collision/ fall/ trauma</td> <td>Caused by overuse/ incorrect technique/ repetitive strain/ sudden increase in training/ reduced recovery/ poor ROM/ lack of warm-up</td> </tr> </tbody> </table>		Acute injuries	Chronic injuries	1.	Sudden/ develop quickly	Develop slowly/ over a period of time	2.	Caused by a knock/ impact/ collision/ fall/ trauma	Caused by overuse/ incorrect technique/ repetitive strain/ sudden increase in training/ reduced recovery/ poor ROM/ lack of warm-up	<p><b>2</b> 2 x AO1</p>	<p><b>KU individual points TICK for comparison</b></p> <p><b>DNA short-term/long-term for point 1</b></p>
	Acute injuries	Chronic injuries											
1.	Sudden/ develop quickly	Develop slowly/ over a period of time											
2.	Caused by a knock/ impact/ collision/ fall/ trauma	Caused by overuse/ incorrect technique/ repetitive strain/ sudden increase in training/ reduced recovery/ poor ROM/ lack of warm-up											
	(b) (ii)	<p>One mark for:</p> <table border="1" data-bbox="376 890 1543 1034"> <thead> <tr> <th></th> <th>Acute injury</th> <th>Chronic injury</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>E.g. fractured leg from high tackle in football</td> <td>E.g. shin splints from too much running on hard surface E.g. tennis elbow/ golfer's elbow</td> </tr> </tbody> </table>		Acute injury	Chronic injury	1.	E.g. fractured leg from high tackle in football	E.g. shin splints from too much running on hard surface E.g. tennis elbow/ golfer's elbow	<p><b>1</b> 1 x AO2</p>	<p><b>KU individual points TICK for comparison</b></p> <p><b>Do not accept: Injury unless related to a sport</b></p> <p><b>Acute:</b> Fracture, torn cartilage, bruise (contusion), haematoma, sprain, strain, graze (abrasion), blister, cut, concussion.</p> <p><b>Chronic:</b> Stress fracture, shin splints (MTSS), tendinosis/itis, bursitis, (osteo)arthritis</p>			
	Acute injury	Chronic injury											
1.	E.g. fractured leg from high tackle in football	E.g. shin splints from too much running on hard surface E.g. tennis elbow/ golfer's elbow											

	<b>(iii)</b>	<p>Three marks from:</p> <ol style="list-style-type: none"> <li>1. Call for medical attention/ ambulance/ doctor/ first aider/ hospital/ surgery</li> <li>2. Immobilise/ keep still/ protect/ support/ rest joint</li> <li>3. Do not attempt to manipulate/ relocate bones</li> <li>4. Ice to reduce swelling/ relieve pain</li> <li>5. Pain medication/ anti-inflammatories</li> </ol>	<b>3</b> (AO1)	<b>DNA SALTAPS</b> <b>'PRICE'</b> on own TV
<b>(c)</b>	<b>(i)</b>	<p>Three marks from:</p> <ol style="list-style-type: none"> <li>1. (joint) Ball and socket joint at hip (allows abduction/ splits/ large ROM)</li> <li>2. (tissues) Greater length/ elasticity of connective tissue/ muscles/ tendons/ ligaments at hip (allowing splits/ larger ROM)</li> <li>3. (training) Flexibility/ mobility <b>training</b> increases the flexibility/ abduction/ ROM at hip</li> <li>4. (temp.) Warm-up used/ increased temperature of tissues (at hip joint to allow splits)</li> <li>5. (hormone) More oestrogen/ relaxin content (in muscles/ connective tissue at hip) increases flexibility</li> <li>6. (Age) Younger gymnasts have greater ROM/ flexibility (at hip joint to allow splits)</li> </ol>	<b>3</b> (AO2)	<b>Description required.</b>  <b>Only accept positive factors that 'enable' the splits – DNA negative factors e.g. flexibility decreases with age</b>
	<b>(ii)</b>	<p>Two marks from:</p> <ol style="list-style-type: none"> <li>1. Increased <u>resting</u> length of muscle/ connective tissue</li> <li>2. Increased elasticity of muscle/ connective tissue</li> <li>3. Muscle spindles adapt to new length of muscle</li> <li>4. Delayed/ reduced/ inhibition of stretch reflex</li> </ol>	<b>2</b> (AO1)	<b>DNA: Reference to golgi tendon organs</b>

	<b>(d)</b>	<p>Six marks from:</p> <p><b>Sub max 4 for description of HIIT</b></p> <ol style="list-style-type: none"> <li>1. Periods of high intensity work <b>and</b> recovery/ rest periods/ intervals</li> <li>2. (duration) 20-60 minutes for full session</li> <li>3. (type) cross-training/ cycling/ running/ boxing/ jumping/ swimming/ star jumps/ burpees etc./ resistance work</li> <li>4. Work intensity 80-95% of max HR/ 70-90% VO<sub>2</sub>max</li> <li>5. Work duration 5 seconds to 8 minutes</li> <li>6. 4-10 sets/ 10+ reps</li> <li>7. Recovery intensity lower or 40-50% of max HR</li> <li>8. Work:relief ratio/ recovery duration = 1:0.5/ 2:1/ 1:1/ work times twice as long or equal to recovery time</li> </ol> <p><b>Sub max 2 for greater effectiveness than continuous training</b></p> <ol style="list-style-type: none"> <li>9. Higher calorie consumption/ greater fat burning</li> <li>10. Faster/ more adaptations to training (than continuous)</li> <li>11. (intensity) Performers can <b>train</b> at a higher intensity for longer</li> <li>12. (duration) Training time/ duration shorter/ quicker sessions (for similar gains)</li> <li>13. Individuals with different fitness levels can train together in group/ class session</li> </ol>	<p><b>6</b> (4 x AO1 2 x AO2)</p>	<p><b>Mark first 2 reasons for greater effectiveness of HIIT only.</b></p> <p><b>Accept any appropriate example of activity for point 3</b></p> <p><b>If a range of numbers is given and one end hits the mark scheme: credit point, e.g. 8-20 reps (credit point 6)</b></p>	
<b>8</b>	<b>(a)</b>	<p>Three marks for:</p> <ol style="list-style-type: none"> <li>1. (Definition N3) For every action/ force (applied to a body) there is an <b>equal and opposite reaction</b> (force)</li> <li>2. (Action) E.g. a shot putter applies a force to a shot</li> <li>3. (Reaction) E.g. the shot applies an equal/ same and opposite reaction/ force <b>to the</b> shot putter</li> </ol>	<p><b>3</b> (1 x AO1 2 x AO2)</p>	<p><b>Accept examples of direction e.g. 'upwards vs downward' as opposite</b></p>	
	<b>(b)</b>	<b>(i)</b>	<p>Four marks for:</p>	<p><b>4</b> (AO2)</p>	<p><b>Two practical examples needed for full marks.</b></p>

		<ol style="list-style-type: none"> <li><b>First</b> class lever (for extension) e.g. triceps extensions/ throwing an object/ tennis serve</li> <li><b>First</b> class lever fulcrum in the middle/ EFL/ LFE/ appropriate diagram</li> <li><b>Third</b> class lever (for flexion) e.g. biceps curls (up or downward phase)/ bowls</li> <li><b>Third</b> class lever effort in the middle/ FEL/ LEF/ appropriate diagram</li> </ol>		<p><b>Accept first 2 responses only if component order annotated, e.g:</b></p> <p>1 – EFL 2 – ELF 3 – FEL</p>
	(ii)	<p>Two marks for:</p> <ol style="list-style-type: none"> <li>(Moment of inertia/MI/I <math>\Rightarrow \sum mr^2/ mr^2/ m \times r^2</math> <b>or</b> <math>10 \times 0.5^2</math> <b>or</b> <math>10 \times (0.5 \times 0.5)</math> <b>or</b> <math>10 \times 0.25</math>)</li> <li>(Moment of inertia/MI/I <math>\Rightarrow</math>) = <u>2.5kgm<sup>2</sup></u></li> </ol>	<p><b>2</b> (AO3)</p>	<p><b>DNA no or incorrect units for point 2</b></p> <p><b>DNA kg/m<sup>2</sup></b></p>
	(c) (i)	<p>Three marks from:</p> <ol style="list-style-type: none"> <li>At A moment of inertia is low/ angular velocity/ <math>\omega</math>/ rate of spin is high <b>because</b> performer is tucked/ mass is close to (transverse) axis of rotation</li> <li>(From A and B) increase in moment of inertia <b>because</b> performer is straightening body position/ untucks/ moving mass away from axis of rotation</li> <li>(From A to B) decrease in angular velocity <b>because</b> the body is increasing its resistance to motion/ straightening/ untucking/ moving mass away from axis of rotation</li> <li>(From A to B) angular momentum is conserved/ remains constant</li> <li>because <math>AM = MI \times AV/\omega</math></li> </ol>	<p><b>3</b> (AO3)</p>	<p><b>Accept start = A</b></p> <p><b>DNA 'sum of' MI and AV as it is the 'product of'</b></p> <p><b>Accept 'centre of mass' as axis of rotation for this question</b></p>
	(ii)	<p>Three marks from:</p>	<p><b>3</b> (AO1)</p>	<p><b>DNA 'conservation' within point 1 as REP of question</b></p>

		<ol style="list-style-type: none"> <li>1. A body will continue (to rotate/ turn about its axis of rotation) with constant angular momentum....</li> <li>2. ....unless acted on by an eccentric/ off-centre force/ torque/ moment of force/ moment</li> <li>3. Angular momentum = moment of inertia x angular velocity/ <math>AM = MI \times AV/\omega</math></li> <li>4. (Once in flight) any change in MI will cause a change in AV to conserve angular momentum/ e.g. if a diver tucks, MI is reduced so AV increases (which means) angular momentum is a conserved through/ during flight</li> <li>5. (shape) Performer can manipulate body shape/ position to change MI and AV as AM remains constant</li> </ol>		
(d)	(i)	<p>Two marks for:</p> <ol style="list-style-type: none"> <li>1. Air resistance from centre of ball and opposing direction of motion/ DOM</li> <li>2. Weight acting vertically downwards from centre of ball</li> </ol>	<p><b>2</b> (AO2)</p>	<p><b>NB: Direction of motion required for point 1</b></p> <p><b>NB: accept any length of arrows</b></p>
	(ii)	<p>Three marks for:</p> <ol style="list-style-type: none"> <li>1. Air resistance and weight originating from same point</li> <li>2. (Dashed) lines added to create a parallelogram</li> </ol>	<p><b>3</b> (AO2)</p>	<p><b>N.B. Diagram can be drawn as a rectangle</b></p> <p><b>DNA lines without arrow</b></p>

			<p>3. Resultant force from origin of W and AR to opposing corner of parallelogram</p> 		<p>heads for point 1 + 3</p>
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<b>Section C</b>		
<b>Question</b>	<b>Answer</b>	<b>Guidance</b>
<b>9*</b>	<p><b>Level 4 (17–20 marks)</b></p> <ul style="list-style-type: none"> <li>• detailed knowledge and excellent understanding (AO1)</li> <li>• well-argued, independent opinion and judgements which are well supported by relevant practical examples (AO2)</li> <li>• detailed analysis and critical evaluation (AO3)</li> <li>• very accurate use of technical and specialist vocabulary</li> <li>• there is a well-developed line of reasoning which is clear and logically structured. The information presented is relevant and substantiated.</li> </ul>	<p><b>At Level 4 responses <u>are likely</u> to include:</b></p> <ul style="list-style-type: none"> <li>• detailed knowledge of the alactacid component of the recovery process after exercise</li> <li>• detailed range of strategies to maximise recovery are evaluated, including strategies that can be used before, during and after exercise</li> <li>• at the top of this level limitations of some strategies have been addressed and an awareness may be shown that the lactacid component of recovery has started</li> <li>• detailed explanation and evaluation of a broad range of nutritional ergogenic aids which is relevant to the recovery process</li> <li>• AO1, AO2 and AO3 all covered well in this level.</li> </ul>
	<p><b>Level 3 (12–16 marks)</b></p> <ul style="list-style-type: none"> <li>• good knowledge and clear understanding (AO1)</li> <li>• independent opinions and judgements will be present but may not always be supported by relevant practical examples (AO2)</li> <li>• good analysis and critical evaluation (AO3)</li> <li>• generally accurate use of technical and specialist vocabulary</li> <li>• there is a line of reasoning presented with some structure. The information presented is in the most-part relevant and supported by some evidence.</li> </ul>	<p><b>At Level 3 responses <u>are likely</u> to include:</b></p> <ul style="list-style-type: none"> <li>• good knowledge of the alactacid component of the recovery process</li> <li>• a range of strategies to aid recovery have been described with some evaluation of their effectiveness</li> <li>• a good range of nutritional ergogenic aids have been explained and some have been evaluated effectively</li> <li>• maximum of 7 marks to be awarded for AO1 and 7 marks for AO2; some AO3 required for top of this level.</li> </ul>

Section C		
Question	Answer	Guidance
	<p><b>Level 2 (7-11 marks)</b></p> <ul style="list-style-type: none"> <li>• limited knowledge and understanding (AO1)</li> <li>• opinion and judgement given but often unsupported by relevant practical examples (AO2)</li> <li>• some evidence of analysis and critical evaluation (AO3)</li> <li>• technical and specialist vocabulary used with limited success</li> <li>• the information has some relevance and is presented with limited structure. The information is supported by limited evidence.</li> </ul>	<p><b>At Level 2 responses <u>are likely</u> to include:</b></p> <ul style="list-style-type: none"> <li>• limited knowledge of the recovery processes in the first three minutes of recovery</li> <li>• some strategies to aid recovery linked to a team game have been described, but with limited evaluation of their effectiveness</li> <li>• some nutritional ergogenic aids have been explained and there may be some evaluation of their effectiveness.</li> <li>• One part of the question may have been addressed much more strongly than the others.</li> <li>• maximum of 7 marks to be awarded for AO1 with no application.</li> </ul>
	<p><b>Level 1 (1–6 marks)</b></p> <ul style="list-style-type: none"> <li>• basic knowledge and little understanding (AO1)</li> <li>• little or no attempt to give opinion or judgement (AO2)</li> <li>• little relevant analysis or critical evaluation (AO3)</li> <li>• little or no attempt to use technical and specialist vocabulary</li> <li>• the information is basic and communicated in an unstructured way. The information is supported by limited evidence and the relationship to the evidence may not be clear.</li> </ul>	<p><b>At Level 1 responses <u>are likely</u> to include:</b></p> <ul style="list-style-type: none"> <li>• basic knowledge of the recovery process</li> <li>• strategies to aid recovery during a game may have been identified and/or described</li> <li>• description of a nutritional ergogenic aid</li> <li>• some inaccurate or irrelevant information may be present</li> <li>• mainly AO1 content.</li> </ul>
	<p><b>(0 marks)</b> No response or no response worthy of credit.</p>	

Q	Indicative content	Mark	Guidance
9*	<p>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. Explain and evaluate nutritional ergogenic aids that help the recovery process.</p> <p>(Recovery process in first three minutes after exercise) <b>(AO1 unless stated)</b></p> <ol style="list-style-type: none"> <li>1. EPOC/ excess post-exercise oxygen consumption <ul style="list-style-type: none"> <li>• Volume of oxygen required to return the body to a pre-exercise state</li> <li>• During exercise bout ATP/ PC/ glycogen depleted/ myoglobin depleted of O<sub>2</sub>/ LA build up</li> </ul> </li> <li>2. Energy is needed to carry out recovery process <ul style="list-style-type: none"> <li>• Use of aerobic system/ aerobic energy production</li> <li>• Respiratory/ circulatory rates remain elevated to supply oxygen/ remove CO<sub>2</sub></li> </ul> </li> <li>3. Alactacid component/ fast component of EPOC <ul style="list-style-type: none"> <li>• (Uses about) 10% of EPOC</li> <li>• Restoration of muscle phosphagen/ resynthesis of ATP and PC</li> <li>• ATP → Energy + P + ADP / Energy + P + C → PC</li> <li>• Takes up to 3 minutes/ 50% restored in 30 seconds</li> <li>• Uses 1-4 litres of oxygen</li> <li>• Restoration of oxy-myoglobin link/ replenishment of blood and muscle oxygen</li> <li>• Hb + O<sub>2</sub> = HbO<sub>2</sub></li> <li>• Takes about 1 minute</li> <li>• Uses 0.5 litres of oxygen</li> <li>• depends on how much ATP-PC system has been used during exercise (AO3)</li> <li>• and on the fitness/ amount of training done by performer (AO3)</li> </ul> </li> <li>4. Lactacid component/ slow component of EPOC <ul style="list-style-type: none"> <li>• also starts (as soon as exercise is completed) but takes about 1 hour to complete</li> <li>• Starts to remove lactic acid/ CO<sub>2</sub></li> <li>• Unable to replenish glycogen stores fully without intake of carbohydrates (AO3)</li> </ul> </li> </ol>	<p><b>20</b></p> <p>7 x AO1 7 x AO2 6 x AO3</p>	<p><b>N.B. AO3 If recovery process are evaluated, but not asked for in question</b></p> <p><b>Highlight</b></p>

Q	Indicative content	Mark	Guidance
	<p>(Strategies to maximise recovery) <b>(AO2 strategies applied to game, AO3 for evaluations)</b></p> <ol style="list-style-type: none"> <li>5. Warm up e.g. before a game of rugby (AO2) <ul style="list-style-type: none"> <li>• Increases flow of oxygenated blood to muscles/ delays OBLA/ lactic acid production</li> <li>• Reduces amount of time performing anaerobically/ reduces oxygen deficit/ EPOC</li> </ul> </li> <li>6. High levels of aerobic/anaerobic fitness (AO2) <ul style="list-style-type: none"> <li>• Anaerobic training to increase efficiency of alactacid debt recovery/ lactic acid tolerance/ buffering/ delay OBLA</li> <li>• Aerobic training to reduce amount of anaerobic work/ lactic acid build up/ buffering/ delay OBLA/ increase O<sub>2</sub> transport/ gas exchange during recovery/ reduces EPOC</li> </ul> </li> <li>7. Application of game tactics (AO2) <ul style="list-style-type: none"> <li>• E.g. slow down tempo of football game keeping possession of ball (AO2)</li> <li>• E.g. use of set plays/ zonal marking instead of man to man in basketball (AO2)</li> <li>• Opportunity for ATP/ PC/ oxy-myoglobin replenishment/ lactic acid removal</li> <li>• Effective tactics used by many top teams/ but tactics may not suit players style</li> <li>• Allows a team to keep star player on pitch/ defensive duties done by others/ but opposition could exploit</li> </ul> </li> <li>8. Time-outs/substitutions (AO2) <ul style="list-style-type: none"> <li>• E.g. 30s time-outs in basketball allowing 50% recovery of PC stores (AO2)</li> <li>• E.g. rolling subs: player off after a pressing play/ high tempo style allowing recovery (AO2)</li> <li>• Effective after high tempo period of play, but limited number allowed per game</li> <li>• In some games e.g. subs can return to game, but in others e.g. football they cannot/ effectiveness depends on laws of sport</li> </ul> </li> <li>9. Use of natural breaks/stoppages in game/ half time (AO2) <ul style="list-style-type: none"> <li>• E.g. tennis player during end changes (AO2)</li> <li>• 90 seconds for change-over which means almost full recovery of alactacid component</li> <li>• E.g. Fast bowler in cricket after their over can stretch/have energy drink on boundary (AO2)</li> <li>• About 3 minutes per over, so full alactacid recovery</li> </ul> </li> </ol>		<p><b><u>named strategies/ named aids</u></b></p> <p><b><u>Highlight DEV stamps that are negative</u></b></p> <p><b>Strategies should be linked to a team game, but some are common to all sports.</b></p> <p><b>Examples applied to a team game are AO2.</b></p> <p><b>Most developments which</b></p>

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	<ul style="list-style-type: none"> <li>• Injury stoppages during match (AO2)</li> <li>• but in rugby game carries on unless serious injury/ injuries can be faked which is gamesmanship/ goes against spirit of game</li> </ul> <p>10. Use of cooling aids/ cold therapy (AO2)</p> <ul style="list-style-type: none"> <li>• Pre-game e.g. ice vests/ cold towel wraps 10-30 minutes before game/ during warm up (AO2)</li> <li>• Reduce core temperature/ thermal strain/ cardiovascular drift reduce fuel depletion</li> <li>• Post-game e.g. ice baths (constrict blood vessels to reduce swelling/ inflammation) (AO2)</li> <li>• (after) dilation of blood vessels flush muscles with O<sub>2</sub> blood/ nutrients - speed up LA removal</li> </ul> <p>11. Cool down/ active recovery/ massage (AO2)</p> <ul style="list-style-type: none"> <li>• Maintains elevated heart/ respiratory rate/ temperature</li> <li>• Maintains venous return/ prevents blood pooling</li> <li>• Speeds up LA removal/ realignment of muscle fibres/ reduce DOMS</li> </ul> <p>Evaluate nutritional ergogenic aids that help the recovery process  <b>(Identify/ describe nutritional aid = AO1, examples = AO2, developed points = AO3)</b></p> <p>12. Carbohydrate/ glycogen loading (AO1)</p> <ul style="list-style-type: none"> <li>• Increases glycogen stores (by up to 50%) (AO3)</li> <li>• Increased endurance/delays fatigue/ reduces EPOC (AO3)</li> <li>• Can cause gastrointestinal problems/ irritability/ hypoglycaemia/ lethargy/ weight gain/ muscle stiffness (AO3)</li> </ul> <p>13. Pre-event meals/ post event meal/ protein intake (AO1)</p> <ul style="list-style-type: none"> <li>• High in carbohydrates hours before event complex/ slow-digesting carbs/ low GI (AO1)</li> <li>• E.g. porridge/ baked beans/ bread/ rice (AO2)</li> <li>• To maximise glycogen stores/ reduce glycogen depletion (AO3)</li> <li>• 1-2 hours before event small/ fast-digesting/ simple carbs/ high GI (AO1)</li> <li>• E.g. white toast/ bagel/ honey/ energy bar (AO2)</li> <li>• Avoid glucose intake immediately before exercise which may cause dizziness/ fatigue/ rebound hypoglycaemia (AO3)</li> </ul>		<p>evaluate/ analyse use of strategies are AO3.</p> <p><b>DNA aids that are not nutritional</b></p>

Q	Indicative content	Mark	Guidance
	<ul style="list-style-type: none"> <li>• High carbohydrate meal within 2 hours post-exercise/ protein shake (AO1)</li> <li>• To maximise glycogen replenishment/ complete lactacid component/ muscle repair (AO3)</li> <li>• Can feel nauseous/ discomfort (AO3)</li> </ul> <p>14. Creatine supplements (AO1)</p> <ul style="list-style-type: none"> <li>• Increased stores of phosphocreatine/ PC in muscle/ increased energy from ATP-PC system (AO3)</li> <li>• Reduces reliance on LA system/ reduced LA build up/ delays fatigue in high intensity activity (AO3)</li> <li>• Gastrointestinal problems/ water retention/ weight gain/ muscle cramps (AO3)</li> </ul> <p>15. Bicarbonate of soda/ soda loading (AO1)</p> <ul style="list-style-type: none"> <li>• HCO<sub>3</sub>/ alkaline/ consumed 1 hour before match (AO1)</li> <li>• Neutralises acidity in blood/ increases buffering capacity/ Increases tolerance to lactic acid/ delays fatigue (AO3)</li> <li>• Can cause nausea/ gastrointestinal problems (AO3)</li> </ul> <p>16. Hydration/ Energy drinks/ gels/ isotonic/ hypertonic drinks (AO1)</p> <ul style="list-style-type: none"> <li>• Maximise glycogen/ glucose replenishment/ replace electrolytes during game (isotonic readily absorbed) (AO3)</li> <li>• Hypertonic drinks should only be used after match has finished (due to higher concentrations of glucose) (AO3)</li> </ul> <p>17. Caffeine (AO1)</p> <ul style="list-style-type: none"> <li>• Stimulates fat metabolism/ preserves glycogen stores/ increases speed of glycogen restoration (AO3)</li> <li>• Diuretic/ causes dehydration/ gastrointestinal problems/ insomnia/ anxiety (AO3)</li> </ul> <p>18. Nitrate (AO1)</p> <ul style="list-style-type: none"> <li>• Dilates blood vessels increasing blood flow to muscles to remove lactate (AO1)</li> <li>• Delays fatigue/ OBLA/ can work at higher intensity for longer (AO3)</li> <li>• Long term health risks are unclear/ possibly carcinogenic/ headaches/ dizziness (AO3)</li> </ul>		<p>e.g. steroids/ EPO/HGH</p> <p>Candidate may state that all of the aids delay OBLA or reduce EPOC, rather than repeating for each aid</p> <p>Look for 'explain'- how it aids recovery and a negative/ risk factor</p>