

**GCE**

**Physical Education**

Unit **H555/01**: Physiological factors affecting performance

Advanced GCE

**Mark Scheme for June 2018**

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This mark scheme is published as an aid to teachers and students, to indicate the requirements of the examination. It shows the basis on which marks were awarded by examiners. It does not indicate the details of the discussions which took place at an examiners' meeting before marking commenced.

All examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes should be read in conjunction with the published question papers and the report on the examination.

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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																
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			<b>2</b> (1 AO1 1 AO2)	<b>DNA 'adapt to high altitude' – REP DNA adaptations to altitude training Credit mainly aerobic egs.</b>															
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			<b>2</b> (AO2)	<b>Accept: 'quick burst of energy' as point 1 only</b>															
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			<b>2</b> (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 or</b> type 2b/ FTG fibres</td> <td>Submaximal <b>force or</b> 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 or</b> type 2b/ FTG fibres	Submaximal <b>force or</b> type 2a/ FOG fibres	4.	E.g. sprinting/ jumping/ throwing	E.g. rowing/ swimming	<b>2</b> (AO2)	<b>Candidate must make comparison for each point KU individual points TICK for comparison Accept comparative language, e.g. 'SE has <u>lower</u> speed of contraction' Credit sporting examples that are clearly using that type of strength specified</b>
	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			<b>2</b> (AO1)	<b>Accept opposites, e.g. identify poor technique</b>															

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		
		Condylloid / Ellipsoidal	Radius, ulna and carpals	Sagittal	(hyper) extension	Wrist extensors	Wrist flexors
	(b)	Four marks for:  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				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)
	(c)	Five marks from: <b>Sub max 4 marks from HOW:</b> (how) 1. Using vasomotor control/ VCC 2. (Vaso)dilation of arterioles leading to <b>working/ leg/ lower body</b> muscles 3. Opening/ dilation of pre-capillary sphincters to <b>working/ leg/ lower body</b> muscles 4. (Vaso)constriction of arterioles to (non-essential) organs/ muscles of upper body 5. Closing/ constriction of pre-capillary sphincters to (non-essential) organs/ upper body muscles (why) 6. <b>working/ leg/ lower body</b> muscles <b>need</b> most/more oxygen/ (oxygenated) blood 7. muscles of upper body <b>need</b> less oxygen/ blood 8. less oxygen/ blood <b>needed</b> at organs/ (non-essential) organs can cope with a (temporary) reduction in blood				5 (AO2)	DNA 'contraction' of arterioles  Accept arteries or blood vessels for arterioles

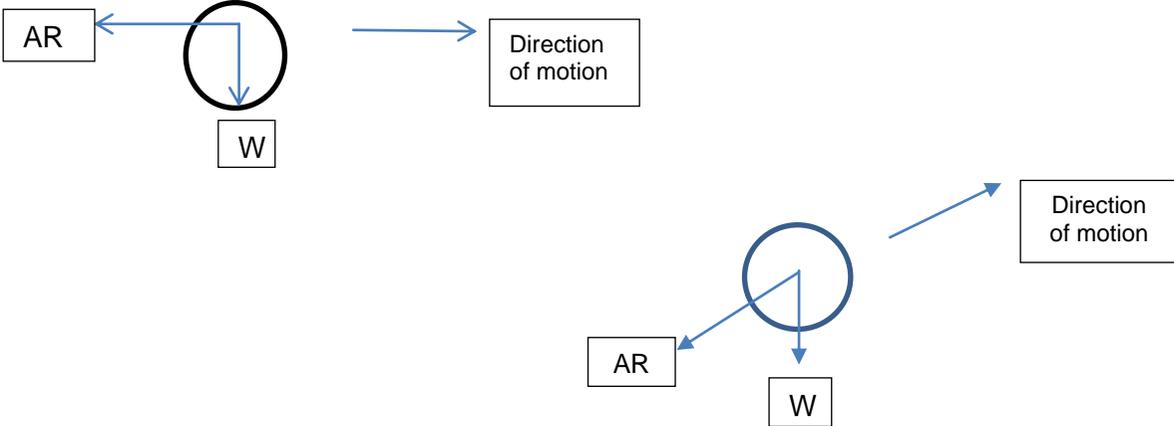
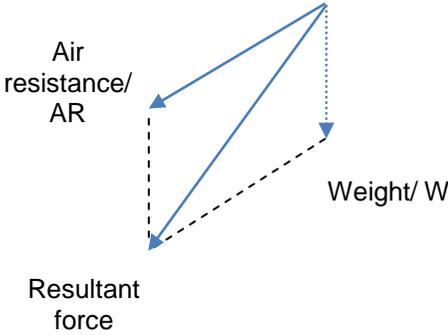
Section B				
Question		Answer	Marks	Guidance
(d)	(i)	Three marks from: 1. <u>External</u> intercostals contract <b>and</b> diaphragm contracts/ flattens 2. upward <b>and</b> outward movement of the rib cage/ sternum 3. This increases the volume of the thoracic/ chest cavity/ space in the lungs 4. Causing a reduction in pressure in the lungs (compared to outside lungs) 5. Gases/ air moves from an area of high to low pressure	<b>3</b> (AO1)	<b>Do not accept: Intercostals on its own.</b>
	(ii)	Two marks from: 1. (efficiency) More efficient O <sub>2</sub> utilisation/ gaseous exchange/ diffusion/ oxygen transportation 2. (adaptations) higher RBC/ Hb volume/ capillarisation/ higher mitochondrial density/ increased surface area of alveoli 3. Fewer breaths taken per minute or lower breathing frequency	<b>2</b> (AO1)	<b>Accept aerobic structural adaptations to training</b>  <b>DNA stronger respiratory muscles</b>

Section B															
Question	Answer			Marks	Guidance										
7	(a)	Three marks for: 1. (how) blood is <b>removed</b> from athlete, (stored) <b>and re-injected</b> into the athlete (4 weeks later) 2. (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 3. (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			<b>3</b> (1 x AO1 2 XAO3)										
	(b)	(i)	Two marks for: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Acute injuries</th> <th style="text-align: center;">Chronic injuries</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1.</td> <td>Sudden/ develop quickly</td> <td>Develop slowly/ over a period of time</td> </tr> <tr> <td style="text-align: center;">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	<b>2</b> 2 x AO1	<b>KU individual points TICK for comparison</b>  <b>DNA short-term/long-term for point 1</b>
	Acute injuries	Chronic injuries													
1.	Sudden/ develop quickly	Develop slowly/ over a period of time													
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	(b)	(ii)	One mark for: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th></th> <th style="text-align: center;">Acute injury</th> <th style="text-align: center;">Chronic injury</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">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	<b>1</b> 1 x AO2	<b>KU individual points TICK for comparison</b>  <b>Do not accept: Injury unless related to a sport</b> <b>Acute:</b> Fracture, torn cartilage, bruise (contusion), haematoma, sprain, strain, graze (abrasion), blister, cut, concussion. <b>Chronic:</b> Stress fracture, shin splints (MTSS), tendinosis/itis, bursitis, (osteo)arthritis			
	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													

Section B				
Question	Answer		Marks	Guidance
	(iii)	<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>	3 (AO1)	<p><b>DNA SALTAPS</b></p> <p><b>'PRICE' on own TV</b></p>
(c)	(i)	<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>	3 (AO2)	<p><b>Description required.</b></p> <p><b>Only accept positive factors that 'enable' the splits – DNA negative factors e.g. flexibility decreases with age</b></p>
	(ii)	<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>	2 (AO1)	<p><b>DNA: Reference to golgi tendon organs</b></p>
(d)		<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> </ol>	6 (4 x AO1 2 x AO2)	<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</b></p>

Section B					
Question	Answer	Marks	Guidance		
	5. Work duration 5 seconds to 8 minutes 6. 4-10 sets/ 10+ reps 7. Recovery intensity lower or 40-50% of max HR 8. Work:relief ratio/ recovery duration = 1:0.5/ 2:1/ 1:1/ work times twice as long or equal to recovery time  <b>Sub max 2 for greater effectiveness than continuous training</b>  9. Higher calorie consumption/ greater fat burning 10. Faster/ more adaptations to training (than continuous) 11. (intensity) Performers can <b>train</b> at a higher intensity for longer 12. (duration) Training time/ duration shorter/ quicker sessions (for similar gains) 13. Individuals with different fitness levels can train together in group/ class session		scheme: credit point, e.g. 8-20 reps (credit point 6)		
8	(a)	Three marks for: 1. (Definition N3) For every action/ force (applied to a body) there is an <b>equal and opposite reaction</b> (force) 2. (Action) E.g. a shot putter applies a force to a shot 3. (Reaction) E.g. the shot applies an equal/ same and opposite reaction/ force <b>to the</b> shot putter	<b>3</b> (1 x AO1 2 x AO2)	Accept examples of direction e.g. 'upwards vs downward' as opposite	
	(b)	(i)	Four marks for: 1. <b>First</b> class lever (for extension) e.g. triceps extensions/ throwing an object/ tennis serve 2. <b>First</b> class lever fulcrum in the middle/ EFL/ LFE/ appropriate diagram 3. <b>Third</b> class lever (for flexion) e.g. biceps curls (up or downward phase)/ bowls 4. <b>Third</b> class lever effort in the middle/ FEL/ LEF/ appropriate diagram	<b>4</b> (AO2)	Two practical examples needed for full marks.  <b>Accept first 2 responses only if component order annotated, e.g:</b> 1 – EFL 2 – ELF 3 – FEL

Section B			
Question	Answer	Marks	Guidance
	(ii) Two marks for: 1. (Moment of inertia/MI/I =) $\sum mr^2$ / $mr^2$ / $m \times r^2$ <b>or</b> $10 \times 0.5^2$ <b>or</b> $10 \times (0.5 \times 0.5)$ <b>or</b> $10 \times 0.25$ 2. (Moment of inertia/MI/I =) = <u>2.5kgm<sup>2</sup></u>	2 (AO3)	DNA no or incorrect units for point 2  DNA kg/m <sup>2</sup>
(c)	(i) Three marks from: 1. At A moment of inertia is low/ angular velocity/ $\omega$ / rate of spin is high <b>because</b> performer is tucked/ mass is close to (transverse) axis of rotation 2. (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 3. (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 4. (From A to B) angular momentum is conserved/ remains constant 5. because $AM = MI \times AV/\omega$	3 (AO3)	Accept start = A DNA 'sum of' MI and AV as it is the 'product of'  Accept 'centre of mass' as axis of rotation for this question
	(ii) Three marks from: 1. A body will continue (to rotate/ turn about its axis of rotation) with constant angular momentum.... 2. ....unless acted on by an eccentric/ off-centre force/ torque/ moment of force/ moment 3. Angular momentum = moment of inertia x angular velocity/ $AM = MI \times AV/\omega$ 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 5. (shape) Performer can manipulate body shape/ position to change MI and AV as AM remains constant	3 (AO1)	DNA 'conservation' within point 1 as REP of question

Section B			
Question	Answer	Marks	Guidance
(d) (i)	<p>Two marks for:</p> <ol style="list-style-type: none"> <li>Air resistance from centre of ball and opposing direction of motion/ DOM</li> <li>Weight acting vertically downwards from centre of ball</li> </ol> 	2 (AO2)	<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>Air resistance and weight originating from same point</li> <li>(Dashed) lines added to create a parallelogram</li> <li>Resultant force from origin of W and AR to opposing corner of parallelogram</li> </ol> 	3 (AO2)	<p><b>N.B. Diagram can be drawn as a rectangle</b></p> <p><b>DNA lines without arrow heads for point 1 + 3</b></p>

<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>

	<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>

Q	Indicative content	Mark	Guidance
	<p>(Strategies to maximise recovery) (<b>AO2 strategies applied to game, AO3 for evaluations</b>)</p> <p>5. Warm up e.g. before a game of rugby (AO2)</p> <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> <p>6. High levels of aerobic/anaerobic fitness (AO2)</p> <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> <p>7. Application of game tactics (AO2)</p> <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> <p>8. Time-outs/substitutions (AO2)</p> <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> <p>9. Use of natural breaks/stoppages in game/ half time (AO2)</p> <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> <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><b><u>Highlight 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>



Q	Indicative content	Mark	Guidance
	<p>15. Bicarbonate of soda/ soda loading (AO1)</p> <ul style="list-style-type: none"> <li>• <math>\text{HCO}_3^-</math>/ 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><b>Candidate may state that all of the aids delay OBLA or reduce EPOC, rather than repeating for each aid</b></p> <p><b>Look for 'explain'- how it aids recovery and a negative/ risk factor</b></p>

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