AQA

A-level
PHYSICAL EDUCATION
7582/2

Paper 2 Factors affecting optimal performance in physical activity and sport

Mark scheme

June 2021

Version: 1.0 Final Mark Scheme

2 1 6 A 7 5 8 2 / 2 / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Level of response marking instructions

Level of response mark schemes are broken down into levels, each of which has a descriptor. The descriptor for the level shows the average performance for the level. There are marks in each level.

Before you apply the mark scheme to a student's answer read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1 Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer and not look to pick holes in small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level and then use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 3 with a small amount of level 4 material it would be placed in level 3 but be awarded a mark near the top of the level because of the level 4 content.

Step 2 Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the Indicative content to reach the highest level of the mark scheme.

An answer which contains nothing of relevance to the question must be awarded no marks.

Section A

Exercise physiology and biomechanics

0 1 Which **one** of the following is classed as a **chronic** injury?

[1 mark]

Marks for this question: AO1 = 1

A – Achilles tendonitis

0 2 Which **one** of the following will **increase** the drag experienced by a cyclist?

[1 mark]

Marks for this question: AO2 = 1

B – Travelling at a higher velocity

0 3 . 1 Describe how sodium bicarbonate works to delay fatigue.

[2 marks]

Marks for this question: AO1 = 2

- Increases the buffering capacity of the blood (1)
- Reduces acidity/neutralises the effect of lactic acid/hydrogen ions (1)
- Delays the onset of blood lactate accumulation/delays OBLA (1)

Accept any other appropriate statement of how sodium bicarbonate works to delay fatigue.

Maximum 2 marks

0 3 . 2 State **one** negative effect of taking sodium bicarbonate.

[1 mark]

Marks for this question: AO1 = 1

- Vomiting (1)
- Diarrhoea (1)
- Bloating (1)
- Stomach cramps (1)

Accept any other appropriate negative effect of taking sodium bicarbonate.

Maximum 1 mark

0 4 . 1 Calculate the cyclist's acceleration between points B **and** C in **Figure 1**.
Give the correct units in your answer.

[2 marks]

Marks for this question: AO2 = 2

- Cyclist's acceleration = 2 (1)
- Units = ms^{-2}/m/s^2/metres per second squared/metres per second per second (1)

Correct answer and correct units required for 2 marks to be awarded.

Accept any other appropriate units used when calculating acceleration.

Maximum 2 marks

0 4 . 2 Identify the **two** points in **Figure 1** between which the cyclist was accelerating at the greatest rate.

[1 mark]

Marks for this question: AO2 = 1

- Points A and B (1)

Allow 0–2 seconds.

Maximum 1 mark

0 5 State **one** exercise-related function of carbohydrates.

[1 mark]

Marks for this question: AO1 = 1

- Source of energy (1)

Accept any other appropriate exercise-related function of carbohydrates.

Maximum 1 mark

0 6 Katarina Johnson-Thompson is a heptathlete competing in multiple events over two days.

Analyse why a lack of sleep between the two days of competition may impair her recovery **and** performance.

[3 marks]

Marks for this question: AO3 = 3

- Lack of non-REM sleep/third stage less blood available to muscles to help recovery, leading to KJT performing below expectations on the second day (1)
- Insufficient sleep can reduce growth hormone production, meaning fatigue caused by the first day's events takes longer to repair, reducing the standard of performance in the second day's events (1)
- Lack of sleep can increase the risk of injury due to reduced concentration/lack of time to repair, could lead to KJT having to compete in the second day's events whilst not fully fit (1)
- Lack of sleep can cause tiredness, which can affect KJT's concentration/delay her reaction time leading to a slow start in sprinting events (1)

Accept any other appropriate analysis of why a lack of sleep between the two days of competition may impair her recovery and performance.

Maximum 3 marks

0 7 A runner has followed a continuous training programme three times per week for the last six weeks to prepare for a 5 km race.

The race is scheduled to take place in four weeks' time.

Analyse how applying the FITT principles to the runner's training could improve their performance during the race.

[8 marks]

Marks for this question: AO1 = 2, AO2 = 3, AO3 = 3

Students are expected to answer in continuous prose, use good English, organise information clearly and use specialist vocabulary where appropriate.

Level	Marks	Description
4	7–8	Knowledge is consistently accurate and well detailed. Application of breadth or depth of knowledge is clearly evident. Analysis and/or evaluation is coherently and consistently made between different relevant factors and their impact. Relevant terminology is consistently used. The answer almost always demonstrates substantiated reasoning, clarity, structure and focus.
3	5–6	Knowledge is usually accurate and detailed. Application of breadth or depth of knowledge is often evident. Analysis and/or evaluation is often made between different relevant factors and their impact, and is usually coherent. Relevant terminology is often used. The answer usually demonstrates substantiated reasoning, clarity, structure and focus.
2	3–4	Knowledge is sometimes accurate with some detail. Application of breadth or depth of knowledge is sometimes evident. Analysis and/or evaluation is sometimes made between different relevant factors and their impact, but may lack coherence. Relevant terminology is sometimes used. The answer occasionally demonstrates substantiated reasoning, but may lack clarity, structure and focus.
1	1–2	Knowledge may be limited. Application of breadth or depth of knowledge may be limited or not evident. There may be little or no analysis and/or evaluation between different relevant factors and their impact. Relevant terminology is occasionally used. The answer may lack substantiated reasoning, clarity, structure and focus.
	0	No relevant content.

Possible content may include:

AO1 Knowledge of the FITT principles.

- Frequency, how often training is carried out.
- Intensity, how hard you train.
- Time, the duration of your training.
- Type, the method used during your training.

AO2 Application of the FITT principles to the runner's training.

- The runner could increase the number of training sessions they carry out each week, eg training 4 times per week instead of 3.
- The runner could increase the intensity of their training sessions by working at a higher average heart rate/higher average speed.
- The runner could increase the duration of their training sessions, eg training for 40 minutes instead of 30 minutes.
- The runner could use a different method of training, eg Interval/Fartlek training instead of continuous training.

AO3 Analysis of how applying the FITT principles to a runner's training could improve their performance.

- Application of the FITT principles to the runner's training would allow for progressive overload ensuring adaptations continue.
- Increase cardiac output/increase A-VO_2 diff/increase myoglobin content/increased lactate threshold, allowing the runner to work at higher intensities for longer without fatiguing.
- Develop the aerobic power necessary to run at a set intensity for prolonged periods, maintaining a consistently fast pace throughout the race.
- Using Fartlek/Interval training stresses both the anaerobic and aerobic energy systems, developing fitness required to undertake a sprint finish during the race.

Accept any other appropriate analysis of how applying the FITT principle to the runner's training could improve their performance during the race.

Maximum 8 marks

0 8 **Figure 2** represents the principle of conservation of angular momentum applied to a gymnast as they perform a front tuck somersault.

Analyse how the gymnast makes use of the principle of conservation of angular momentum when performing a front tuck somersault.

Refer to **Figure 2** in your answer.

[15 marks]

Marks for this question: AO1 = 4, AO2 = 5, AO3 = 6
Students are expected to answer in continuous prose, use good English, organise information clearly and use specialist vocabulary where appropriate.

Level	Marks	Description
5	13–15	Knowledge is consistently comprehensive, accurate and well detailed. Application of breadth or depth of knowledge is clearly evident. Analysis and/or evaluation is coherently and consistently made between different relevant factors and their impact. Relevant terminology is almost always used. The answer demonstrates a high level of substantiated reasoning, clarity, structure and focus.
4	10–12	Knowledge is usually comprehensive, accurate and detailed. Application of breadth or depth of knowledge is often evident. Analysis and/or evaluation is often made between different relevant factors and their impact, and is usually coherent. Relevant terminology is usually used. The answer usually demonstrates substantiated reasoning, clarity, structure and focus.
3	7–9	Knowledge is generally accurate and sometimes detailed. Application of breadth or depth of knowledge is sometimes evident. Some analysis and/or evaluation is made between different relevant factors and their impact, but may sometimes lack coherence. Relevant terminology is used but may sometimes be missing. The answer sometimes demonstrates substantiated reasoning, clarity, structure and focus.
2	4–6	Knowledge is sometimes accurate but may lack detail. Application of breadth or depth of knowledge is occasionally evident. Some analysis and/or evaluation is attempted between different relevant factors and their impact, but is likely to lack coherence. Relevant terminology is occasionally used. The answer occasionally demonstrates substantiated reasoning, but may lack clarity, structure and/or focus at times.
1	1–3	Knowledge is limited and may lack accuracy and detail. Application of breadth or depth of knowledge is likely to be limited or not evident. There may be very little or no analysis and/or evaluation made between different relevant factors and their impact. Relevant terminology used only very occasionally. The answer often lacks substantiated reasoning, clarity, structure and/or focus.
	0	No relevant content.

Possible content may include:

AO1: Knowledge of the principle of conservation of angular momentum.

- Angular momentum is the quantity of rotation a body possesses, and is a product of moment of inertia and angular velocity/angular momentum = moment of inertia X angular velocity.
- Moment of inertia is a body's reluctance to rotation/reluctance to alter its rate of rotation.
- Angular velocity is the rate of rotation of a body around its axes of rotation.
- Angular acceleration is the rate of change of angular velocity.
- The principle of conservation of angular momentum states that angular momentum remains constant, if moment of inertia decreases, angular velocity increases and vice versa.

AO2: Application of the principle of conservation of angular momentum when the gymnast performs a front tuck somersault.

- Moment of inertia is high at the start and the end of the somersault but low in the middle of the movement.
- Angular velocity is low at both the start and the end of the somersault but high in the middle.
- Angular acceleration is occurring as the performer begins the somersault, and angular deceleration occurs as they complete the somersault.
- Angular velocity is low at the start and end of the somersault as they go into and come out of the somersault, slowing the rate of rotation.
- Angular momentum remains constant throughout the somersault.

AO3: Analysis of how the principle of conservation of angular momentum affects the gymnast when performing a front tuck somersault.

- The gymnast is in an open position initially, resulting in a large moment of inertia, resulting in a low angular velocity.
- The gymnast gets into a tucked position. As mass is distributed closer to their centre of mass this reduces their moment of inertia and increases their angular velocity/rate of rotation.
- The angular acceleration as a result of the gymnast's reduced moment of inertia, and increased angular velocity allow a full rotation to occur quickly, allowing the gymnast time to land safely.
- As the gymnast opens out from the tucked position, their moment of inertia increases, mass is distributed further from the centre of mass and angular velocity decreases/angular deceleration, allowing the gymnast to slow down prior to landing, maintaining control.
- Angular momentum remains constant as the gymnast manipulates their body position to reduce moment of inertia and increase angular velocity whilst maintaining angular momentum.

Accept any other appropriate analysis of how the gymnast uses the principle of conservation of angular momentum when performing a front tuck somersault.

Maximum 15 marks

Section B

Sport psychology

0 9 Which **one** of the following is the **second** stage of group formation according to Tuckman's model?

[1 mark]

Marks for this question: AO1 = 1

D – Storming

1 0 A golfer sets herself the goal of keeping her head still throughout her swing.

Identify which type of goal this is.

[1 mark]

Marks for this question: AO2 = 1

C – Process

1 1 Define 'aggression' **and** 'assertive behaviour'. Give a sporting example of each.

[4 marks]

Marks for this question: AO1 = 2, AO2 = 2

Aggression:

- intent to cause harm outside of the rules of the sport (1)
- eg punching/kicking an opponent in rugby/football (1)

Assertive behaviour:

- a forceful act within the rules of the sport (1)
- eg tackling an opponent forcefully, but legally in football/rugby/hockey (1)

Accept first two answers only.

Accept any other appropriate definitions and examples of aggression and assertive behaviour.

Maximum 4 marks

1 2 State **three** strategies a coach can use to prevent a performer behaving aggressively in a competitive situation.

[3 marks]

Marks for this question: AO1 = 3

- Punish/substitute the performer for behaving aggressively (1)
- Reinforce non-aggressive behaviour/promote non-aggressive role models (1)
- Talk to the performer during a break in play (1)
- Practice thought-stopping/mental rehearsal/imagery/other stress management techniques in training/before the match (1)
- Assign the performer to a position of responsibility in the team (1)

Accept any other appropriate strategies a coach could use to prevent a performer behaving aggressively in a competitive situation.

Maximum 3 marks

1 3 **Figure 3** shows a four-person rowing crew.

The rowers carry out their roles individually but at the same time, relying on co-ordination to be successful.

Evaluate the impact of task **and** social cohesion on the performance of a rowing crew.

[3 marks]

Marks for this question: AO3 = 3

Impact of task cohesion (sub-max = 1)

- Strong task cohesion is (most) important to performance, having co-ordination/high levels of motivation to achieve a common goal is crucial for successful performance as a crew (1)

Impacts of social cohesion, and task and social cohesion combined (sub-max = 2)

- Social cohesion can impact positively on the rowing crew's performance − if the crew socialise together frequently they may be willing to exert even more effort in training and competition (1)
- Social cohesion could be detrimental to performance if cliques form, increasing likelihood of social loafing, reducing the effort/agreement to execute tactics (1)
- High levels of both task and social cohesion may bring about better performances than having either high task or high social cohesion alone (1)

Accept any other appropriate evaluation of the impact of task and social cohesion on the performance of a rowing crew.

Maximum 3 marks

1 4 The diver in **Figure 4** may use cognitive techniques such as mental rehearsal, visualisation, and imagery to manage stress immediately before performance.

Analyse how the diver could use **other** cognitive stress management techniques to improve their performance in a competition. Refer to catastrophe theory in your answer.

[8 marks]

Marks for this question: AO1 = 2, AO2 = 3, AO3 = 3

Students are expected to answer in continuous prose, use good English, organise information clearly and use specialist vocabulary where appropriate.

Level	Marks	Description
4	7–8	Knowledge is consistently accurate and well detailed. Application of breadth or depth of knowledge is clearly evident. Analysis and/or evaluation is coherently and consistently made between different relevant factors and their impact. Relevant terminology is consistently used. The answer almost always demonstrates substantiated reasoning, clarity, structure and focus.
3	5–6	Knowledge is usually accurate and detailed. Application of breadth or depth of knowledge is often evident. Analysis and/or evaluation is often made between different relevant factors and their impact, and is usually coherent. Relevant terminology is often used. The answer usually demonstrates substantiated reasoning, clarity, structure and focus.
2	3–4	Knowledge is sometimes accurate with some detail. Application of breadth or depth of knowledge is sometimes evident. Analysis and/or evaluation is sometimes made between different relevant factors and their impact, but may lack coherence. Relevant terminology is sometimes used. The answer occasionally demonstrates substantiated reasoning, but may lack clarity, structure and focus.
1	1–2	Knowledge may be limited. Application of breadth or depth of knowledge may be limited or not evident. There may be little or no analysis and/or evaluation between different relevant factors and their impact. Relevant terminology is occasionally used. The answer may lack substantiated reasoning, clarity, structure and focus.
	0	No relevant content.

Possible content may include:

AO1: Knowledge of cognitive stress management techniques and catastrophe theory.

- Attentional control and cue utilisation involves choosing the correct style of attention for the right circumstances.
- Thought-stopping involves saying a particular word or carrying out a particular action to divert attention away from negative thoughts.
- Positive self-talk involves using an uplifting phrase to replace negative thoughts.
- Catastrophe theory suggests that arousal beyond optimal results in the sudden/dramatic decline in performance.

AO2: Application of cognitive stress management techniques and catastrophe theory to the diver.

- When using attentional control the diver may focus on a weakness such as their entry position using a narrow internal style/the end of the diving platform using a narrow external style/may select a particular diving routine in response to their competitors' scores using a broad internal style.
- When the diver has negative thoughts such as 'I cannot complete this dive' thought-stopping could involve the diver clicking fingers/clapping hands to prevent this.
- Diver may say a familiar phrase before each dive, eg 'you have nailed this dive in training hundreds of times'.
- According to catastrophe theory, if the diver fails to control negative thoughts/self-doubt they may perform poorly/experience a sudden drop in performance levels, such as mistiming the dive.

AO3: Analysis of how the diver could use other cognitive stress management techniques to improve their performance in a competition.

- Positive self-talk/thought-stopping can be used to divert attention away from negative thoughts, helping to moderate cognitive anxiety levels.
- If the diver chooses the correct attentional style then information overload can be avoided, lowering cognitive anxiety.
- If cognitive anxiety is moderated effectively by using these cognitive stress management techniques arousal levels will be optimal leading to a good performance/catastrophe can be avoided.
- If stress management techniques are used effectively the timing/entry/aesthetics of the dive are likely to be improved benefitting performance.
- If cognitive anxiety is not controlled and somatic anxiety is high over-arousal can cause a dramatic/sudden decline in performance/lead to catastrophe.

Accept any other appropriate analysis of how the diver could use **other** cognitive stress management techniques to improve their performance in a competition.

Maximum 8 marks

1 5 A coach can use observations, questionnaires, or physiological measures to obtain data on anxiety levels.

Evaluate the use of each measure to provide valid and reliable data to assess anxiety in sport.

[15 marks]

Marks for this question: AO1 = 4, AO2 = 5, AO3 = 6

Students are expected to answer in continuous prose, use good English, organise information clearly and use specialist vocabulary where appropriate.

Level	Marks	Description
5	13–15	Knowledge is consistently comprehensive, accurate and well detailed. Application of breadth or depth of knowledge is clearly evident. Analysis and/or evaluation is coherently and consistently made between different relevant factors and their impact. Relevant terminology is almost always used. The answer demonstrates a high level of substantiated reasoning, clarity, structure and focus.
4	10–12	Knowledge is usually comprehensive, accurate and detailed. Application of breadth or depth of knowledge is often evident. Analysis and/or evaluation is often made between different relevant factors and their impact, and is usually coherent. Relevant terminology is usually used. The answer usually demonstrates substantiated reasoning, clarity, structure and focus.
3	7–9	Knowledge is generally accurate and sometimes detailed. Application of breadth or depth of knowledge is sometimes evident. Some analysis and/or evaluation is made between different relevant factors and their impact, but may sometimes lack coherence. Relevant terminology is used but may sometimes be missing. The answer sometimes demonstrates substantiated reasoning, clarity, structure and focus.
2	4–6	Knowledge is sometimes accurate but may lack detail. Application of breadth or depth of knowledge is occasionally evident. Some analysis and/or evaluation is attempted between different relevant factors and their impact, but is likely to lack coherence. Relevant terminology is occasionally used. The answer occasionally demonstrates substantiated reasoning, but may lack clarity, structure and/or focus at times.
1	1–3	Knowledge is limited and may lack accuracy and detail. Application of breadth or depth of knowledge is likely to be limited or not evident. There may be very little or no analysis and/or evaluation made between different relevant factors and their impact. Relevant terminology used only very occasionally. The answer often lacks substantiated reasoning, clarity, structure and/or focus.
	0	No relevant content.

Possible content may include:

AO1 Knowledge of observations, questionnaires, physiological measures, validity, and reliability.

- Questionnaires are a series of questions used to assess the levels of anxiety experienced by a performer.
- Observations involve watching a performer during competition to assess signs of anxiety evident in their performance.
- Physiological measures monitor symptoms of somatic anxiety including increased heart rate, perspiration/sweating, respiration rate, secretion of certain hormones/adrenaline.
- Validity describes whether the data collected actually measures what it sets out to measure.
- Reliability refers to the degree to which data collection is consistent and stable over time.

AO2 Explanation of the advantages and disadvantages of observations, questionnaires, and physiological measures to assess anxiety in sport.

Advantages of observations, questionnaires, and physiological measures:
- questionnaires are quick/cheap/efficient to use allowing large amounts of data to be collected
- observations are carried out whilst the performer is training or competing allowing the coach to assess anxiety in the most relevant environment
- physiological measures provide objective numerical data and can be carried out in a real-life training/competitive environment.

Disadvantages of observations, questionnaires, and physiological measures:
- the questions in a questionnaire may not be fully understood or be biased meaning the performer's responses are not a true reflection of a performer's anxiety levels
- the performer's responses to questionnaires might be affected by their mood/when and how they are asked to respond/performers may not respond honestly
- observations are highly subjective and require prior knowledge of the performer.
- observations are very time consuming
- physiological measures must be interpreted as all changes will not be due to anxiety
- using any method where the performer is aware they are being assessed may alter their behaviour/responses/make them more anxious.

AO3: Evaluation of the use of observations, questionnaires, or physiological measures to assess anxiety in sport with specific reference to validity and reliability.

Measures are valid/reliable:
- questionnaire responses can provide reliable information as they allow the performer time to consider their answers and typical responses
- observations/physiological measures can provide valid information on anxiety levels as the performer is observed/physiological measures can be taken in a real life setting
- the data from physiological measures is objective/is not affected by the performer's mood/situational factors which makes it more reliable.

Measures are not valid/reliable:
- if questions within questionnaires are inappropriate/biased/misunderstood by the performer the results may not be valid
- the reliability of observations is questionable as the observer may draw different conclusions when presented with the same information
- using any method where the performer is aware they are being assessed may alter their behaviour/responses/make them more anxious which decrease the validity of the data.

Accept any other appropriate evaluation of the use of each measure to assess anxiety in sport with reference to validity and reliability. **Maximum 15 marks**

Section C

Sport and society and technology in sport

1 6 Which **one** of the following organisations **only** provides support to talented athletes?

[1 mark]

Marks for this question: AO1 = 1

C – UK Sport

1 7 Two adults play badminton for the purpose of physical recreation.

In which **one** of the following levels of the sporting development continuum does this activity occur?

[1 mark]

Marks for this question: AO2 = 1

B − Participation

1 8 Evaluate the effectiveness of **three** different measures put in place to improve spectator safety at football matches.

[3 marks]

- All-seater stadia reduce risk of overcrowding, improving safety, but ensuring all spectators sit is difficult to enforce (1)
- Earlier kick-off times reduce the opportunity to drink alcohol prior to games, reducing levels of violence, but spectators drink after the game instead leading to violence (1)
- Sale of alcohol is controlled inside stadia, and in the surrounding area, reducing likelihood of violence, but spectators drink before entering the stadium meaning violence still occurs (1)
- Tougher deterrents for hooliganism, racism and anti-social behaviour, including fines, imprisonment and life-time bans, but hooliganism, racism and anti-social behaviour still occur, showing deterrents have not been effective (1)
- CCTV/increased policing/increased security/intelligence mean that those breaking law/rules can be ejected from the stadium and banned, but persistent offenders who have been banned are still able to enter stadia on occasions/escape identification (1)
- Segregation of home and away fans inside the stadium prevents violence between fans, however rival fans able to meet outside the stadia before or after matches (1)

Each measure needs to be evaluated to score each mark.

Accept any other appropriate evaluation of the effectiveness of measures put in place to improve spectator safety at football matches.

Maximum 3 marks

1 9 . 1 State **two** other functions of sports analytics.

[2 marks]

Marks for this question: AO1 = 2

- Monitor fitness for performance (1)
- Assess the development of the skill/techniques of a performer (1)
- Reduce/prevent injuries from occurring (1)
- Identify talented individuals/scouting (1)

Accept any other appropriate functions of sports analytics.

Maximum 2 marks

1 9 . 2 Explain how technology can be used to carry out game analysis in a team sport.

[2 marks]

Marks for this question: AO2 = 2

- Video analysis can be used to assess the technical performance of individual players/the number of successful passes completed/shooting accuracy/interceptions (1)
- GPS data can be used to assess effort of individual players/the total distance covered, the number of sprints/high intensity effort carried out (1)

Accept any other appropriate explanation of how technology can be used to carry out game analysis in a team sport.

Maximum 2 marks

2 0 Using testing and recording equipment such as a metabolic cart for indirect calorimetry can provide useful information about performance.

Describe what a metabolic cart is **and** how it can be used to carry out indirect calorimetry.

[3 marks]

Marks for this question: AO1 = 3

- Includes headgear, a computer, a screen and breathing tubes (1)
- Indirect calorimetry measures the volume of O_2 consumed and CO_2 produced (1)
- This can be used to calculate RER/which fuels are being used to sustain activity at a set intensity (1)

Accept any other appropriate description of what a metabolic cart is and how it can be used to carry out indirect calorimetry.

Maximum 3 marks

2 1 In 2012, Lance Armstrong was stripped of his seven Tour de France titles and given a lifetime ban for using banned substances including erythropoietin (EPO).

Evaluate the choice made by other professional cyclists to inject EPO instead of relying on altitude training alone to improve performance. Refer to the physiological effects of EPO on the cyclist in your answer.

[8 marks]

Marks for this question: AO1 = 2, AO2 = 3, AO3 = 3

Students are expected to answer in continuous prose, use good English, organise information clearly and use specialist vocabulary where appropriate.

Level	Marks	Description
4	7–8	Knowledge is consistently accurate and well detailed. Application of breadth or depth of knowledge is clearly evident. Analysis and/or evaluation is coherently and consistently made between different relevant factors and their impact. Relevant terminology is consistently used. The answer almost always demonstrates substantiated reasoning, clarity, structure and focus.
3	5–6	Knowledge is usually accurate and detailed. Application of breadth or depth of knowledge is often evident. Analysis and/or evaluation is often made between different relevant factors and their impact, and is usually coherent. Relevant terminology is often used. The answer usually demonstrates substantiated reasoning, clarity, structure and focus.
2	3–4	Knowledge is sometimes accurate with some detail. Application of breadth or depth of knowledge is sometimes evident. Analysis and/or evaluation is sometimes made between different relevant factors and their impact, but may lack coherence. Relevant terminology is sometimes used. The answer occasionally demonstrates substantiated reasoning, but may lack clarity, structure and focus.
1	1–2	Knowledge may be limited. Application of breadth or depth of knowledge may be limited or not evident. There may be little or no analysis and/or evaluation between different relevant factors and their impact. Relevant terminology is occasionally used. The answer may lack substantiated reasoning, clarity, structure and focus.
	0	No relevant content.

Possible content may include:

AO1 Knowledge of altitude training and erythropoietin (EPO).

- Altitude training is carried out at least 2500 m above sea level, where pO_2 is lower leading to an increase in EPO.
- Erythropoietin (EPO) is a naturally occurring hormone.
- Synthetic EPO can be manufactured.
- EPO increases red blood cell count/haemoglobin levels/O_2 carrying capacity/delays OBLA.

AO2 Application of use of altitude training and erythropoietin (EPO) for an elite road cyclist.

- EPO/altitude training would increase the cyclist's ability to work aerobically at high intensity, maintaining speed throughout a stage/race.
- EPO/altitude training allows the cyclist to maintain high intensity effort without experiencing fatigue, meaning they can sprint at the finish of a stage/race.
- EPO/altitude training will allow the cyclist to recover more quickly following a sprint/hill climb.
- EPO/altitude training will allow the cyclist to maintain higher intensities for longer without experiencing fatigue, maintaining their position in the peloton/group.

AO3 Evaluation of the choice made by a professional cyclist to inject EPO rather than just relying on altitude training alone.

Why an elite road cyclist may choose to inject EPO:

- EPO can be injected simply and quickly allowing the cyclist to maintain their training without interruption
- injecting EPO will avoid the acclimatisation period/sickness/initial reversibility associated with altitude training
- the benefits of injecting EPO can be sustained for long periods avoiding the difficulty of peaking for competition experienced with altitude training
- injecting EPO avoids the need for a cyclist to spend long periods away from home, avoiding the psychological impact of being away from family and friends/cost of travel to altitude

Why an elite road cyclist may choose **not** to inject EPO:

- EPO is a banned substance, by injecting it the cyclist risks being banned from the sport/loss of income/damaged reputation
- injecting EPO gives the cyclist an unfair advantage making it immoral/unethical and against the principle of fair play
- by injecting EPO the cyclist is at increased risk of blood clots/stroke/fatality.

Accept any other appropriate evaluation of the choice made by a professional cyclist to inject EPO rather than just relying on altitude training to enhance their performance.

Maximum 8 marks

2 2 Analyse how support provided by the National Institutes of Sport has helped to improve the performance of British elite track cyclists.

[15 marks]

Marks for this question: AO1 = 4, AO2 = 5, AO3 = 6

Students are expected to answer in continuous prose, use good English, organise information clearly and use specialist vocabulary where appropriate.

Level	Marks	Description
5	13–15	Knowledge is consistently comprehensive, accurate and well detailed. Application of breadth or depth of knowledge is clearly evident. Analysis and/or evaluation is coherently and consistently made between different relevant factors and their impact. Relevant terminology is almost always used. The answer demonstrates a high level of substantiated reasoning, clarity, structure and focus.
4	10–12	Knowledge is usually comprehensive, accurate and detailed. Application of breadth or depth of knowledge is often evident. Analysis and/or evaluation is often made between different relevant factors and their impact, and is usually coherent. Relevant terminology is usually used. The answer usually demonstrates substantiated reasoning, clarity, structure and focus.
3	7–9	Knowledge is generally accurate and sometimes detailed. Application of breadth or depth of knowledge is sometimes evident. Some analysis and/or evaluation is made between different relevant factors and their impact, but may sometimes lack coherence. Relevant terminology is used but may sometimes be missing. The answer sometimes demonstrates substantiated reasoning, clarity, structure and focus.
2	4–6	Knowledge is sometimes accurate but may lack detail. Application of breadth or depth of knowledge is occasionally evident. Some analysis and/or evaluation is attempted between different relevant factors and their impact, but is likely to lack coherence. Relevant terminology is occasionally used. The answer occasionally demonstrates substantiated reasoning, but may lack clarity, structure and/or focus at times.
1	1–3	Knowledge is limited and may lack accuracy and detail. Application of breadth or depth of knowledge is likely to be limited or not evident. There may be very little or no analysis and/or evaluation made between different relevant factors and their impact. Relevant terminology used only very occasionally. The answer often lacks substantiated reasoning, clarity, structure and/or focus.
	0	No relevant content.

Possible content may include:

AO1 Knowledge of the support provided by the National Institutes of Sport.

- Sports science support/physiologists/psychologists/biomechanists/performance analysts/nutritionists.
- Sports medicine and rehabilitation/physiotherapists.
- Lifestyle support services/financial advice.
- Provide access to high quality facilities.
- Provide access to high quality coaching/the most highly qualified/experienced coaches.
- Involved in cutting edge research and innovation.

AO2 Application of knowledge of how National Institutes of Sport support elite cyclists.

- Sports science can be used to analyse fitness levels eg lactate threshold.
- Sports psychologists will help elite cyclists to devise and implement strategies to meet their unique needs.
- Sports nutritionists will design an individualised nutritional strategy for each cyclist that meets their unique needs.
- Support from physiotherapists means cyclists minimise the impact injuries can have on training and performance.
- Strength and conditioning coaches will produce bespoke, periodised, training programmes for each cyclist to follow.
- Lifestyle support service is provided for negotiating sponsorship deals/interactions with the media/budgeting.
- Cyclists have frequent access to Olympic standard velodromes for training/competition.
- Access to cutting edge clothing and bikes using the latest technology to improve aerodynamics.

AO3 Analysis of the support provided by the National Institutes of Sport and how this has helped to improve the performance of elite track cyclists.

- Regular monitoring of fitness levels allows cyclists to ensure their training is effective/be in peak physical condition for important competitions.
- Psychological strategies will help the cyclists to cope with the pressure of training and competition, enabling the cyclists to perform at their best when it matters most.
- A bespoke nutritional plan will ensure that the cyclists maintains an optimal body composition for their event and recover from intense training and competition quickly/have the right levels of nutrients for optimal performance.
- Minimising injuries will allow cyclists to avoid the effects of reversibility, ensuring they're fit to compete in the highest profile competitions for the biggest prizes.
- A bespoke strength and conditioning programme will allow each cyclist to optimise important attributes such as power to weight ratio, important for cycling as fast as possible.
- Support with sponsorship deals/media training/budgeting allows the cyclists to focus fully on their training, allowing them to perform at their best in competition.
- Training at Olympic standard venues regularly will allow this to become familiar meaning the cyclist will feel comfortable when competing in similar environments.
- The technical and tactical understanding of the coaches will allow the cyclists to make the most progress during each training session/competition.
- Cutting edge clothing/bikes developed using the latest technology will allow the cyclist to improve their times/average speeds/average power output.

Accept any other appropriate analysis of how the support provided by the National Institutes of Sport has helped the performance of British elite track cyclists.

Maximum 15 marks