



A-level PHYSICAL EDUCATION 7582/2

Paper 2 Factors affecting optimal performance in physical activity
and sport

Mark scheme

June 2025

Version: 1.0 Final



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.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

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

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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

Applied anatomy and physiology

0 1

Different types of data are collected from laboratory or field tests.

Which **one** of the following terms is used to describe data which is based on judgement on how well a test was performed?

[1 mark]

Marks for this question: AO1 = 1

C – Subjective

0 2

A discus will generate lift when thrown with the optimal angle of attack.

Which **one** of the following correctly describes the air flow **and** resulting pressure change when this occurs?

[1 mark]

Marks for this question: AO2 = 1

A – Air passing over the discus travels further than the air passing under it, decreasing the pressure above the discus

0 3

Linear motion involves both vector and scalar quantities.

Give **three** examples of scalar quantities.

[3 marks]

Marks for this question: AO1 = 3

- Mass
- Speed
- Distance

Accept any other appropriate example of a scalar quantity including time / work / energy.

Maximum 3 marks

0 4 . 1 One example of a common sports injury is a sprain.

Describe a sprain.

[1 mark]

Marks for this question: AO1 = 1

- Where a ligament is stretched too far / tears. (1)

Accept any other appropriate description of the term sprain.

Maximum 1 mark

0 4 . 2 Explain how **three** different methods of injury prevention could decrease the likelihood of a sprain.

[3 marks]

Marks for this question: AO2 = 3

- Screening **because** it can identify joints with hypermobility / allow additional strengthening of joints to be done. (1)
- Protective equipment / eg wicket keeper gloves **because** it can reinforce joints / limit excessive movements at a joint. (1)
- A warm-up **because** it will improve the function of muscles around joints / prepare muscles to maintain stability at joints. (1)
- Training **because** it will improve the strength of muscles surrounding a joint / increase stability of joints. (1)
- Taping / bracing **because** it will add additional support to joints / prevent excessive movement at joints. (1)
- Stretching / improved flexibility **because** it will increase mobility / safe range of motion. (1)

Accept any other appropriate explanation of how three different methods used in injury prevention would decrease the likelihood of a sprain occurring.

Maximum 3 marks

0 5

Figure 1 shows a performer during a dive.

Evaluate the effectiveness of the diver using PNF (Proprioceptive Neuromuscular Facilitation) as a training method.

[3 marks]

Marks for this question: AO3 = 3

Effective for a diver (sub max 2)

- Specifically improves flexibility which is an essential component of fitness for a diver. (1)
- Would allow a diver to perform more difficult dives with higher tariffs attached / higher scores from the judges (difficulty). (1)
- Would allow the diver to perform more aesthetic dives resulting in higher scores from the judges (execution). (1)
- Would allow a diver to complete more complex moves with less risk of getting injured as a result. (1)
- Improve flexibility more / more quickly than other methods of training, allowing the diver to produce better dives sooner. (1)

Ineffective for a diver (sub max 2)

- Only focuses on flexibility, which means the diver does not develop the power / co-ordination / other components of fitness they require. (1)
- Increased risk of injury which would impact on the diver's ability to train / compete. (1)
- Decreased power output if completed too close to a competition which would limit the diver's height off the board. (1)
- Does not develop technique which is ultimately what the diver is scored on. (1)

Where alternative training methods are suggested, they can only be credited if linked to the limitations of PNF eg plyometric training may be more suitable as PNF does not improve power which is important for a diver.

Accept any other appropriate evaluation of the effectiveness of the diver using PNF as a training method.

Maximum 3 marks

0 6	A triathlete will need vitamins, minerals, fibre, and water to maintain the healthy functioning of their body. Analyse how the other food classes allow the triathlete to maximise their performance. [8 marks]
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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 classes of food

- **Carbohydrates:** Primary source of energy especially at higher intensities. Found in foods such as fruit/pasta.
- **Fats:** Source of energy at low intensities. Can be saturated (eg animal fats), unsaturated (eg olive oil, avocado), or trans fat (eg processed foods).
- **Protein:** Provide amino acids for growth and repair. Found in foods such as meat, fish, and eggs providing.

AO2 Application of classes of food to a triathlete

- Carbohydrates provide energy for the increased amount of exercise triathletes do eg high training volume / long race.
- Fats provide energy for the high volume of lower intensity exercise triathletes perform eg low intensity long training sessions.
- Protein required to repair the high amounts of muscle damage that will be caused by long duration swim / bike / run training sessions.

AO3 Analysis of how classes of food could maximise the triathlete's performance

- Carbohydrates will allow them to complete training sessions to the best of their ability to maximise their fitness/races to the best of their ability to be successful.
- Fats will allow them to conserve glycogen stores for more intense sections of training/races preventing them from 'hitting the wall'.
- Fats are also important in maintaining the function of the body as they transport fat-soluble vitamins to where they are needed. Without these the triathlete may feel unwell and not be able to train/race as well.
- A triathlete would want to consume unsaturated fats as saturated fats may lead to additional weight gain which would slow them down when producing the same power outputs.
- Protein will allow the triathletes' muscles to grow/repair/recover following training sessions becoming stronger/more injury resistant.

Accept any other appropriate analysis of how the **other** food classes allow the triathlete to maximise their performance.

Maximum 8 marks

0 7

Figure 2 shows a volleyball player jumping upward. The player is performing a block as they move from **Position A** to **Position B**.

Analyse how the musculo-skeletal **and** lever systems operating at the knees **and** ankles contribute to gaining maximum height in the jump.

[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 knee, ankle, and key terminology linked to musculo-skeletal and lever systems

Knee

- Hinge joint.
- Articulating bones are femur and tibia.
- Quadriceps and hamstring are antagonistic pair.

Ankle

- Hinge joint.
- Articulating bones are tibia, fibula and talus.
- Gastrocnemius and tibialis anterior are antagonistic pair.

Levers

- Comprised of fulcrum/pivot, resistance/load, effort.

AO2 Application to the knee and ankle during the jump

Knee

- The knee extends.
- This is caused by the quadriceps.
- Contracting isotonic concentrically.
- This is a third-class lever system.

Ankle

- The ankle plantar flexes.
- This is caused by the gastrocnemius.
- Contracting isotonic concentrically.
- This is a second-class lever system.

AO3 Analysis of effect on performance of the movements and levers occurring at the knee and ankle

Knee

- Third-class lever system has a longer resistance arm than effort arm.
- This system has a mechanical disadvantage meaning the force produced is lower.
- It does mean that the lever system can move at high speeds and with a greater range of movement.
- This allows the volleyball player to jump quickly/explosively into the air.
- If the athlete has bigger/stronger quadricep muscles this will increase the force produced allowing them to jump higher if the mass remains the same.

Ankle

- Second-class lever system has a longer effort arm than resistance arm.
- This system has a mechanical advantage meaning it produces high force.
- This is important as ankle joint required to lift the weight of the whole body.
- The two lever systems combine/complement each other to jump with maximum height / with high force and speed.

Accept any other appropriate analysis of how the musculo-skeletal **and** lever systems operating at the knees **and** ankles contribute to gaining maximum height in the jump.

Maximum 15 marks

Section B

Sport psychology

0 8

Which **one** of the following is an effective strategy to develop approach behaviours in the early stages of skill development?

[1 mark]

Marks for this question: AO1 = 1

A – Allow success with little effort

0 9

A high jumper observes a performer of a similar ability successfully completing their jump.

Which factor from Bandura's model of self-efficacy is this an example of?

[1 mark]

Marks for this question: AO2 = 1

D – Vicarious experience

1 0

At optimal arousal levels a performer may experience peak flow.

State **three** characteristics of peak flow experience.

[3 marks]

Marks for this question: AO1 = 3

- Clear goals. (1)
- Highly focused on the task / good selective attention / fully absorbed in the activity. (1)
- Movement feels effortless. (1)
- High levels of confidence / self-efficacy / belief in ability. (1)
- Subconscious feelings of control / being on autopilot. (1)

Accept any other appropriate characteristics of peak flow experience.

Maximum 3 marks

1 1

Name **two** types of anxiety experienced in sport. Give a sporting example of each.

[4 marks]

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

- **Cognitive (1):** negative thoughts / worry about an upcoming putt in golf. (1)
- **Somatic (1):** getting butterflies / sweating before kick-off in a big football match. (1)
- **(Competitive) trait (1):** feeling anxious before all tennis matches. (1)
- **(Competitive) state (1):** feeling anxious when taking a penalty flick in hockey. (1)

Accept any other appropriate sporting examples of the named types of anxiety.

Maximum 4 marks

1 2

Evaluate the effectiveness of an autocratic style of leadership when coaching gymnastics.

[3 marks]

Marks for this question: AO3 = 3

Most effective (sub max 2)

- It is time efficient, which could be useful if the coach has lots of instructions to give to the gymnasts / the gymnasts require lots of time to practise their routine / prepare for a competition. (1)
- It is useful as gymnastics could be dangerous, therefore keeps performers safe. (1)
- It is useful if the gymnasts were novices as an autocratic style will give them clear guidance on what they are required to do. (1)

Not effective (sub max 2)

- It can limit the gymnast's creativity / decision-making skills meaning they are less independent / creative when devising routines. (1)
- It can be less effective with experienced gymnasts who may want to be involved in the decision-making process. (1)
- It can be a demotivating style to use which can then limit the gymnast's effort. (1)

Where alternative leadership styles are suggested, they can only be credited if linked to the limitations of an autocratic style eg an autocratic style limits the input from autonomous performers so a democratic style may be more effective.

Accept any other appropriate evaluation of the effectiveness of an autocratic style of leadership when coaching gymnastics.

Maximum 3 marks

1	3	A footballer kicks an opponent because they think they have been fouled. They then get their first ever red card. After the game, they apologise to the opponent and their teammates. Evaluate whether instinct theory or social learning theory of aggression best accounts for the player's actions. [8 marks]
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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.

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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 instinct theory and social learning theory of aggression

Instinct theory

- All performers are born with an aggressive instinct which would surface with enough provocation.
- Individual players are born with different levels of aggressive instinct which will surface at different levels of provocation.
- These characteristics are innate.
- The release of aggression has a cathartic effect calming the player back down.

Social learning theory

- Aggression is a learned response, copied from others.
- We are more likely to copy action we see being reinforced through rewards or punishment.
- We are more likely to copy actions we see performed by significant others eg family or role models.

AO2 Application to the footballer

Instinct theory

- Instinct theory would suggest that in this case the required level of provocation had been reached by the foul on the footballer.
- This resulted in the innate aggressive response occurring when he kicked the opposition player.
- The release of aggression would have had a cathartic / calming effect on the player, and thus he may have regretted his action after the game.

Social learning theory

- The footballer may have seen a role model on TV kick an opponent in a similar situation.
- If they were not punished or were praised for their actions this would have increased the likelihood of the footballer copying these actions.
- After copying his role model the player was punished and if he received no reinforcement / criticism he may have realised his actions were wrong and apologised as a result.

AO3 Evaluation of whether instinct theory or social learning theory of aggression best accounts for the player's actions

Instinct theory

- In this situation it does appear that the footballer's aggressive act was instinctive and spontaneous because of the perceived foul / not pre-planned or learned.
- The fact that the player calmed down after enough to recognise his mistake and apologise also supports the theory of aggressive acts having a cathartic effect.
- However, it is unlikely that they player will not have been fouled before, and, as this is the first time he has been sent off, something must have been different for this foul to result in an act of violence.

Social learning theory

- If the footballer has previously seen a player kick someone then social learning theory does explain their actions.
- However, we have nothing to say they have, and people act aggressively even when they have not learned to do so which social learning theory does not account for.

- It is likely that a combination of the player's traits and social learning, as well as situational specific factors, all combined to contribute to the player's aggressive response.

Accept any other appropriate evaluation of whether instinct theory or social learning theory of aggression best accounts for the player's actions.

Maximum 8 marks

1 4

Analyse why a games player may form a poor attitude towards training **and** how a coach could change this attitude using knowledge of attitude formation and cognitive dissonance.

[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.

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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.
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	0	No relevant content.

Possible content may include:

AO1 Knowledge of attitudes, attitude formation, and cognitive dissonance

Attitude formation is affected by:

- past experiences
 - socialisation
 - conditioning
 - familiarity.
- Cognitive dissonance is new information given to the performer to cause unease (dissonance) between the components of an attitude to motivate change.
 - An attitude has three components:
 - Cognitive component – how the person thinks about an attitude object
 - Affective component – how the person feels about an attitude object
 - Behavioural component – how the person acts towards an attitude object.

AO2 Application to a player with a poor attitude towards training

- **Cognitive component:** the player thinks training is not beneficial.
- **Affective component:** the player feels bored when training.
- **Behavioural component:** the player does not try hard when training.
- **Past experiences:** the player may have had negative experiences of low-quality training so does not value it.
- **Socialisation:** the player may have observed role models or significant others who did not value training and still performed well so now shares these values.
- **Conditioning:** the player may not have been conditioned to train hard having never been praised or rewarded when they have.
- **Familiarity:** the player may have come from a different environment where not a lot of training is done so is not familiar with it.

AO3 Analysis of how a coach could change this attitude using knowledge of attitude formation and cognitive dissonance

To improve the player's attitude towards training using knowledge of attitude formation a coach could:

- **Past experiences:** provide the player with high quality, enjoyable training sessions.
- **Socialisation:** show the player examples of role models/teammates who train hard.
- **Conditioning:** reward the player when they do show effort in training.
- **Familiarity:** use extrinsic motivation to encourage the player to train regularly/more so they become familiar with it more quickly.
- Cognitive dissonance would involve changing one component of the players current attitude they could do this by:
 - **Cognitive component** – monitor the progress that the player makes in training so they can see the benefits of working hard.
 - **Affective component** – use a games-based approach to training so sessions are fun.
 - **Behavioural component** – use extrinsic motivation to encourage the player to work hard in training in the short term.

Accept any other appropriate analysis of how a player may form a poor attitude towards training **and** how a coach could change this attitude using knowledge of attitude formation and cognitive dissonance.

Maximum 15 marks

Section C

Sport and society

1 5

Which **one** of the following is **not** a primary role of UK Sport?

[1 mark]

Marks for this question: AO1 = 1

C – Organise grass roots competitions

1 6

Which **one** of the following is defined as ‘bending the rules of a sport to the limit, without getting caught or punished’?

[1 mark]

Marks for this question: AO1 = 1

B – Gamesmanship

1 7

State **three** ways a coach should ensure they fulfil their duty of care to their players.

[3 marks]

Marks for this question: AO1 = 3

- Keep up-to-date contact details.
- Keep up-to-date medical records.
- Keep up-to-date records of attendance.
- Maintain appropriate supervision ratios.
- Ensure first-aid provision is available.
- Ensure all coaches have up-to-date DBS clearance.
- Ensure they have completed up-to-date risk assessments.

Accept any other ‘reasonable’ measures that a coach should take to keep performers safe (fulfil their duty of care).

Maximum 3 marks

1 8 . 1 State **two** characteristics of physical recreation.

[2 marks]

Marks for this question: AO1 = 2

- (Rules) modified rules. (1)
- (Officials) usually self-officiated. (1)
- (Reason for taking part) – completed for intrinsic rewards / enjoyment / fun / stress relief / health and fitness. (1)
- (When they take part) – voluntary / choice / leisure time / not time bound. (1)

Accept any other appropriate characteristics of physical recreation.

Maximum 2 marks

1 8 . 2 Explain **two** reasons why someone may choose to take part in sport rather than take part in physical recreation.

[2 marks]

Marks for this question: AO2 = 2

- Sport is more competitive which increases the level of challenge. (1)
- Clearly defined rules / officials in sport mean that there is more structure. (1)
- Sport is organised (generally by NGB's) which can provide access to development pathways / representative honours. (1)
- Extrinsic rewards are available in sport eg medals / trophies which may offer additional motivation. (1)
- Access to professional levels for those who wish to pursue sport as a vocation. (1)
- Coaching / training will result in a greater level of skill development / personal performance improvements. (1)

Accept any other appropriate explanation of two reasons why someone may choose to take part in sport over physical recreation.

Maximum 2 marks

1 9	Evaluate the impact of commercialisation on officials in sport.	[3 marks]
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Marks for this question: AO3 = 3

Positive impacts (sub max 2 marks)

- Increase in salary / paid more money and so could then become a full-time profession / career pathway. (1)
- More money can be invested into supporting technologies to allow officials to make better / more accurate decisions. (1)
- Increased funding can lead to greater support network of officials leading to more frequent / better training. (1)
- More money brings increased status allowing officials to become role models / famous. (1)

Negative impacts (sub max 2 marks)

- Due to larger sums of money being involved there is increased pressure on officials to make the right decisions. (1)
- Larger sums of money involved increase likelihood of players demonstrating deviant behaviours / gamesmanship which makes the game more difficult to officiate. (1)
- Bad performance / wrong decision / misconduct could result in the official losing their job. (1)

Accept any other evaluation of the impact of commercialisation on officials in sport.

Maximum 3 marks

2 0

The World Hour Record requires a cyclist to cover the furthest possible distance on a velodrome track in 60 minutes.

Figure 3 shows Victor Campenaerts breaking the record in 2019. The record was then broken by Dan Bigham in 2022.

Analyse the ways technology has helped cyclists to break this world record.

[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.

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	0	No relevant content.

Possible content may include:

AO1 Knowledge of technology in sport

- Video and analysis programmes.
- Testing and recording equipment.
- Use of GPS and motion tracking software and hardware.
- Monitor fitness for performance.
- Injury prevention.
- Impact of material technology on equipment.
- Facilities.

AO2 Application to cycling

- Video and analysis programmes allow the cyclists to ensure they are in the optimum riding position.
- Testing and recording equipment eg metabolic cart allows cyclists to calculate their RER/VO₂ max.
- Use of GPS and motion-tracking software and hardware allows the cyclist to analyse the biomechanics of their cycling technique.
- Technology allows the cyclist to monitor their aerobic fitness to chart progress.
- Injury prevention would keep the cyclist healthy and in the saddle.
- Impact of material technology on equipment means that bikes are lighter/more aerodynamic/more efficient.
- Facilities – there are more velodromes now.

AO3 Analysis of the ways technology has helped cyclists to break this world record

- (Video and analysis programmes allow the cyclists to ensure they are in the optimum riding position). This can minimise drag increasing the speed the athletes travel at for the same energy output.
- (Testing and recording equipment eg metabolic cart allows the cyclists to calculate their RER/VO₂ max). By carrying out these tests cyclists can calculate their lactate/anaerobic threshold and therefore target the power output they know sits right on this limit for most of the hour.
- (Use of GPS and motion-tracking software and hardware allows the cyclist to analyse the biomechanics of their cycling technique). This allows the cyclist to fine-tune their technique in order to maximise the power from each pedal stroke.
- (Technology allows the cyclist to monitor their aerobic fitness to chart progress). This would help the cyclist to set effective SMARTER goals in progressing toward their final attempt.
- (Injury prevention would keep the cyclist healthy and in the saddle). This would avoid the reversibility associated with periods away from training when injured.
- (Impact of material technology on equipment means that bikes are lighter/more aerodynamic/more efficient). Lighter bikes mean that the cyclist does not need to use as much power to generate the same amount of speed.
- (Facilities – there are more velodromes now). This allows the cyclists to practice under race conditions without having to travel a great distance.

Accept any other appropriate analysis of the ways technology has helped cyclists to break this world record.

Maximum 8 marks

2 1**Table 1** shows the number of positive doping results recorded for six Olympic Games.

Evaluate the effectiveness of the strategies used for the elimination of performance enhancing drugs in the Olympic Games.

Refer to the data in **Table 1** 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 strategies used for elimination of performance enhancing drugs in sport

- Random testing/more testing.
- Education programmes.
- Increased investment in testing programmes.
- Unified policies for testing drugs/punishing offenders.
- The use of positive role models/name and shame the negative role models.
- Stricter punishments for offenders.

AO2 Application of strategies used for elimination of performance enhancing drugs in sport to the Olympics

- (Random testing/more testing) Any athlete can be tested at any time during the games/all medallists drug tested/'Whereabouts' programme means testers have access to athletes every day.
- (Education programmes) Athletes are educated about the importance of being responsible for what they put in their bodies even when travelling/abroad.
- (Increased investment in testing programmes) The tests used are the most advanced available/testing can now be completed retrospectively so athletes are testing positive from previous games.
- (Unified policies for testing drugs/punishing offenders) Russia banned from competing at the games due to a failure to adhere to drug-testing policies.
- (The use of positive role models/name and shame the negative role models) Clean multi-Olympic medal winners like Jessica Ennis-Hill are held up as role models while drugs cheats such as Dwayne Chambers are villainised.
- (Stricter punishments for offenders) Athletes can now be handed immediate bans during the games if they test positive.

AO3 Evaluation of the effectiveness of the strategies used for elimination of performance enhancing drugs in the Olympics with reference to the data in Table 1

- The data clearly shows that after peaking in 2012 the number of positive drugs tests has decreased in the last two games which would suggest that the strategies being put in place are effective.
- Athletes are now more likely to get caught due to the increased volume and effectiveness of testing so may be less likely to take a risk.
- The increase in education is effective as it makes it less likely that athletes will ingest banned substances accidentally and then test positive.
- However, the sharp decline in positive tests may be due to an improvement in the masking of drugs/new drugs which are not tested for.
- Retrospective testing may see the numbers for the most recent games increase meaning strategies are not as effective as they seem.
- The banning of whole countries like Russia was effective as it has forced clean Russian athletes to have to prove their innocence before they are able to compete / large decrease in positive tests following ban.

Accept any other appropriate evaluation of the effectiveness of the strategies used for elimination of performance enhancing drugs in the Olympic Games with reference to the data in **Table 1**.

Maximum 15 marks