



St Mary's GCSE PE

End of Topic Test – Applied Anatomy & Physiology (2)

Mark Scheme

Multiple-choice questions

Q1. Which of the following sports/ activities is **NOT** a type of AEROBIC respiration?

(1 mark)

Marks for this question: A01 = 1

C

Q2. Lactic acid occurs when an athlete's body is:

(1 mark)

Marks for this question: A01 = 1

D

Q3. Which of the following is not an immediate effect of exercise?

(1 mark)

Marks for this question: A01 = 1

B

Q4. Which of the following best describes Excess Post-exercise Oxygen Consumption (EPOC)?

(1 mark)

Marks for this question: A01 = 1

C

Q5. One benefit of a cool down is:

(1 mark)

Marks for this question: A01 = 1

B

Q6. Which of the following is **NOT** a SHORT-TERM effect of exercise:

(1 mark)

Marks for this question: A01 = 1

C

Structure & function of the musculoskeletal system

Q7. Explain the role of the muscular and skeletal system in producing movement. Give an example from physical activity in your answer.

(5 marks)

Marks for this question: A01 = 1, A02 = 4

Award **one** mark for identifying a relevant example.

Award a further **four** marks for an explanation of how muscles and bones work together to produce movement.

- Muscles are attached to bones via tendons (1)
- The origin is attached to the bone that doesn't move/ the insertion is attached to the bone that moves (1)
- Muscles can only pull/ and are arranged in pairs (antagonistic) (1)
- One contracts (shortens or flexes or agonist or prime mover)/ and one relaxes (lengthens or antagonist) (1).
- Ligaments keep the joint stable (1)
- Movement can only occur at a joint (1)

Maximum 5 marks

Q8. The image shows a young cricketer bowling. The bowling action involves the use of many joints within the body.

8.1 Identify the type of synovial joint working at the knee.

(1 mark)

Marks for this question: AO1 = 1

Hinge (1)

Maximum 1 mark

8.2 Outline how **two** of the features of the knee joint aim to prevent injury occurring.

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of two marks.

- Shape of the articular surface/ bones – allows bones to fit together (1)
- Ligaments – attach bone to bone/ restrict movement (1)
- Joint capsule/ fibrous capsule – lined with synovial membrane/ encloses/ supports/ joints (1)
- Synovial membrane – secretes synovial fluid (1)
- Synovial fluid – provides lubrication (1)
- Cartilage (hyaline/ articular) – prevents friction/ stops bones rubbing together (1)
- Bursae (sacks of fluid) – to reduce friction (1)

Accept any other suitable explanation of features of the knee joint that prevent injury occurring.

Answers must refer to the knee joint.

Maximum 2 marks

Blood vessels/ Redistribution of blood

Q9. Describe **two** STRUCTURES and **one** FUNCTION of an artery.

(3 marks)

Marks for this question: AO1 = 3

Award **one** mark for each of the following structural points up to a maximum of two marks.

- Thick muscular walls (1)
- Small internal diameter/ lumen (1)
- Elastic muscular walls (1)

Award **one** mark for each of the following functions of an artery.

- Carry blood away from the heart (1)
- Most carry oxygenated blood (1)
- Stretch as blood surges through them and return to normal shape/ they have a pulse (1)

Maximum 3 marks

Q10. What is the function of valves present in veins?

(1 mark)

Marks for this question: AO1 = 1

Prevent backflow of blood/ assist blood in flowing in one direction (1)

Maximum 1 mark

Q11. Describe the process of vasodilation.

(1 mark)

Marks for this question: AO1 = 1

The widening of the internal diameter/ lumen of a blood vessel to increase the volume of blood travelling through it (1)

Maximum 1 mark

Cardiac output, stroke volume & heart rate

Q12. Briefly explain the terms 'cardiac output' and 'stroke volume' and the relationship between them.

(3 marks)

Marks for this question: AO1 = 2, A02 = 1

Award **one** mark for each of the following points up to a maximum of two marks.

- Cardiac output – the volume/ amount of blood ejected/ pumped from the heart in one minute (1)
 - stroke volume x heart rate (1)
- Stroke volume – the volume of blood pumped out by the heart by each ventricle during one contraction.

Award any other suitable definition of cardiac output and stroke volume.

Award **one** mark for one of the following points up to a maximum of one mark.

- Cardiac output (Q) = stroke volume (SV) x heart rate (HR) (1)
- When stroke volume increases so too will cardiac output. (1)

Maximum 3 marks

Q13. What is the cardiac output of a performer who has a stroke volume of 80 mls and a heart rate of 70 beats per minute?

(1 mark)

Marks for this question: AO1 = 1

Award **one** mark for the following:

Cardiac output (Q) = stroke volume (SV) x heart rate (HR)

Cardiac output (Q) = 80mls x 70bpm

Cardiac output (Q) = 5600 ml/min or 5.6 l/ min (1)

Maximum 1 mark

Aerobic & anaerobic exercise

Q14. Distinguish between aerobic and anaerobic exercise

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of **two** marks.

- Aerobic exercise – takes place in the presence of oxygen/ working at a low to moderate intensity so that the body has time to use oxygen for energy production/ break down glucose and can work for a long period of time (1)
- Anaerobic exercise – takes place in the absence of enough oxygen/ working for short periods of time/ glucose is converted into energy without oxygen to allow short duration, high intensity work (1)

Award any other suitable definitions/ differences between aerobic and anaerobic exercise.

Maximum 2 marks

Q15. What is lactic acid?

(1 mark)

Marks for this question: AO1 = 1

A waste product produced during anaerobic exercise/ causes fatigue and muscle soreness (1).

Maximum 1 mark

Q16. What is Excess Post-exercise Oxygen Consumption?

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of two marks.

- Extra oxygen required after exercise (1)
- Maintains high breathing rate to repay oxygen debt and remove carbon dioxide (1)

Maximum 2 marks

Structure & function of the cardio-respiratory system

Q17. Zack is a 16-year-old GCSE PE student. He is just about to play a game of basketball for his school team.

17.1 Zack's respiratory system will experience a number of changes before and during the game of basketball.

Define the terms tidal volume **and** residual volume.

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of two marks.

- Tidal volume – volume of air inspired or expired/ exchanged per breath (1)
- Residual volume – volume of air left in the lungs after maximal expiration (1)

Accept any other suitable definitions for tidal volume and residual volume.

Maximum 2 marks

17.2. Outline what will happen to Zack's tidal volume **and** residual volume once exercise starts.

(2 marks)

Marks for this question: AO2 = 2

Award **one** mark for each of the following points up to a maximum of two marks.

- Tidal volume increases (once exercise starts) (1)
- Residual volume stays the same (once exercise starts) (1)

Maximum 2 marks

The recovery process

Q18. List three different ways that recovery from exercise can be assisted.

(3 marks)

Marks for this question: AO1 = 3

Award **one** mark for each of the following points up to a maximum of three marks.

- Cool down (1)
- Ice baths (1)
- Massage (1)
- Manipulation of diet (1)

Maximum 3 marks

Q19. After performing any period of training, a cool down is important.

Identify **two** parts of an effective cool down.

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of two marks.

- Maintain elevated breathing and heart rate, eg walk, jog to gradually reduce heart rate (1)
- Aim to gradually reduce intensity of exercise/ don't just stop (1)
- Stretching of major muscles used in that session (1)

Accept any other suitable identification of part of an effective cool down.

Maximum 2 marks

Q20. Ice baths are another effective process used to recover from exercise.

How do ice baths help prevent DOMS?

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of two marks.

- Flush out waste/ lactic acid; reduce swelling

- Cold temperatures cause blood vessels to constrict, forcing lactic acid out. Blood vessels dilate when you get out to bring oxygenated blood in

Maximum 2 marks

The effects of exercise

Q21. Identify **three** IMMEDIATE effects of exercise on the body.

(3 marks)

Marks for this question: AO1 = 3

Award **one** mark for each of the following points up to a maximum of **three** marks.

- Heart rate will increase as the heart works harder to deliver oxygen to the working muscles (1)
- Feel hotter as body temperature increases (1)
- Will breathe more deeply/ more frequently as the body delivers oxygen to working muscles (1)
- Will sweat and skin will redden as part of the body's temperature control (1)

Maximum 3 marks

Q22. Describe **three** LONG-TERM effects of exercise on the body.

(3 marks)

Marks for this question: AO1 = 3

Award **one** mark for each of the following points up to a maximum of **three** marks.

- Body will change shape/ reduction of body weight (1)
- Improvements in components of fitness e.g. increase in strength, muscular endurance, cardiovascular endurance (1)
- Increase in muscle size and strength through hypertrophy (1)
- Heart will increase in size through cardiac hypertrophy/ cardiac hypertrophy increases/ deliver more oxygen, remove more waste products from working muscles (1)
- Lower resting heart rate/ bradycardia (1)

Maximum 3 marks

Q23. Why might body shape change following repeated exercise?

(2 marks)

Marks for this question: AO1 = 2

Award **one** mark for each of the following points up to a maximum of **two** marks.

- Loss of weight/ fat stores are used to supply glucose
- Increased muscle bulk/ hypertrophy when completing anaerobic exercise

Maximum 2 marks

Long answer questions

Q24. Explain the importance of redistribution of blood during a football match.

(6 marks)

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

- Vasoconstriction and vasodilation of the blood vessels allows the redistribution of blood flow within the body.
- This means that the body is able to increase blood flow to some areas and decrease it to others. For example, at the start of the football match, through vasoconstriction, blood flow is diverted away from the digestive system and through vasodilation it is directed instead to the active muscles.
- This is because not so much blood is required for digestion and be sent to areas where the need is greater, to help with performance.
- An increased blood flow to the working muscles means that they will receive more oxygenated blood, as oxygen is transported in the blood. With more oxygen, the player will be able to maintain the standard of their play for the duration of the match, for example, continuing to perform effective tackles even late on in the game.
- However, there is a drawback: the performer would not be able to eat just before they played or at half-time if they were feeling hungry. This could leave them with low energy levels for the second half; therefore they may need to eat a sports bar or something similar that is easy to digest.
- Despite the potential problem with not being able to eat, the advantage of the extra oxygen clearly outweighs the chance that someone is hungry, as they can always make sure they get enough to eat on match days in plenty of time before they play.
- Also, although they player will not be running all of the time in the game, they still need an elevated supply of oxygen and therefore blood flow as they will need to recover in between bouts of high-intensity exercise. For example, after chasing a loose ball and passing it on they will need to walk or jog back to position, ready for the next high-intensity demand. Therefore, they will need to be able to regulate blood flow to allow for this as well.
- Without the ability to recover quickly, they would soon stop being effective in the game; for example, they would not be able to run onto through balls or keep up with fast counter attacks.

Maximum 6 marks

Q 25. A good recovery routine will be important for an athlete. Describe the best way for an athlete to recover after a hard training session or competition. Explain why a good recovery routine is necessary and how it will benefit his future performance in training or in competition.

(9 marks)

Marks for this question: AO1 = 2, AO2 = 2, AO3 = 5

Level	Marks	Description
3	6-8	Full description of the recovery process and full explanation of why it is needed and its benefits. Students spell, punctuate and use rules of grammar accurately and use a wide range of specialist terms precisely.
2	3-5	Description of recovery process and some explanation of why it is needed and its benefits. Students spell, punctuate and use the rules of grammar with reasonable accuracy and use a range of specialist terms appropriately.
1	1-2	Brief description of the recovery process and limited explanation of why it is needed and its benefits. Students spell, punctuate and use the rules of grammar with some accuracy. Limited use of specialist terms.
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Possible content may include:

Indicative content linked to sprinting but can be applied to any named sporting activity.

AO1– Knowledge of recovery processes and how they can benefit a performer, eg

- active cool down consists of gentle jog/ stretching to maintain elevated breathing rate and blood flow
- dietary factors need to replenish stores lost during exercise fluids to prevent dehydration/ carbohydrate to replenish energy stress/ protein to repair micro tears in muscle fibres.
- to repair and help prevent muscle soreness eg massage to remove toxins, ice bath.

AO2 – Application to a named sport/ activity (must include links to the sport/ activity chosen), eg (Sprinting)

- expiration of breath removes carbon dioxide and other waste from our lungs increased oxygen taken in and delivered to muscles to repay oxygen debt perspiration helps with temperature control and removes excess water lactic acid is flushed from the system all the removal of waste products leaves the body clear of toxins and able to continue with training

AO3 - Justifications made with specific reasoned conclusions fully linked and appropriate to named sporting activity, eg (sprinting)

Example Answers

Level 1 (1 mark)

The best way for David to recover after his training is to do a cool down, this will hopefully stop him feeling stiff the next day.

Level 2 (4 marks)

David would need to do a cool down after each training session. This would consist of a slow jog and some simple stretches. The cool down is to get rid of waste products that will have built up in his body during his training. If he doesn't do this his muscles will ache the next day and it may be difficult to train. A massage after training will help his muscles recover. It will be important for David to make sure he eats the right food after he trains so he can carry on training.

Level 3 (9 marks)

It will be important that David does an active cool down after training to help him recover. This would mean a slow jog to bring his heart rate down and stretches of all the main muscle groups. The active cool down helps maintain blood flow to flush lactic acid out of his system and stop blood pooling. It helps to repay the oxygen debt built up during training. This means that David is unlikely to experience delayed onset of muscle soreness, which will have a positive impact on his sprinting performance the following day and the days after in training or competition. His quadriceps and hamstring muscles will be flushed of lactic acid

and will be able to work (contract) very effectively, resulting in David being able to perform at his best. He will be able to push off effectively from the starting blocks using his gastrocnemius and quadriceps muscles and run the full race to his potential. David could also have an ice bath and massage to help his muscles recover and stop muscles aching so he can carry on training. The ice bath temperature will cause the blood vessels around his working muscles to vasoconstrict, which helps to force the lactic acid out back towards the heart. When he exits the ice bath, his blood vessels will vasodilate causing fresh, oxygenated blood to rush in and supply the muscles with oxygen and nutrients to help with the recovery process. As a result David's muscles will be free of most lactic acid which will help prevent the delayed onset of muscle soreness experienced the day after anaerobic exercise. He should be able to train or compete effectively the following day.

END OF QUESTIONS