

L3 Lead Examiner Report 2001

January 2020

**L3 Sport & Exercise Science
Unit 2: Functional Anatomy
(31814H)**

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What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link:

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Unit 2: Functional Anatomy (31814H)

Grade	Unclassified	Level 3			
		N	P	M	D
Boundary Mark	0	10	21	32	44

Introduction

This is the sixth series of external examinations with regards to the new specification. Centres and learners should be acknowledged for their preparation. Overall, most learners were prepared and knowledgeable on various content from the specification for this assessment

The paper was divided into 12 questions. The questions were designed to progress from the lowest number of marks gained to the highest marks, in order to develop learner confidence whilst progressing through the paper. Questions 1 – 9 allowed learners to address questions from 2 to 6 marks, whilst question 10 to 12 ranged from 8 to 14 marks; requiring an extended response from the learners. Each question was based on functional anatomy, allowing the learner to demonstrate knowledge and understanding of a range of specification content. Questions 1 to 10 generally addressed sections A to E of the specification; whilst questions 11 and 12 allowed the learner to demonstrate their knowledge and understanding of the interrelationships of the muscular and skeletal systems in movement analysis.

Questions 1 to 9 on the paper were assessed using a traditional points based approach, where a mark was given for each appropriate point (more information can be found below in the individual question section of the report).

Questions 10 to 12 required an extended response, and these were marked using a 'levels based' approach to assessment where the overall quality of the response was considered rather than number of facts stated alone.

Individual Questions

The following section considers each question on the paper, providing examples of learner responses and a brief commentary of why the responses gained the marks they did. This section should be considered with the live external assessment and corresponding mark scheme.

Q1

This was an accessible question with the vast majority of learners achieving at least 2 out of 4 marks for stating the two other types of joint classification.

Answer ALL questions. Write your answers in the spaces provided.

Table 1 shows a classification of a joint and an example of its location in the body.

1 Complete the table by:

- stating **two other** classifications of joint
- giving an example of a location of each classification of joint in the body.

Classification of joint	Location in the body
Fibrous	Cranium
Synovial	wrist
Cartilaginous	vertebral column

Table 1

(Total for Question 1 = 4 marks)

This response gained all 4 marks

The two other joint classifications were stated; synovial and cartilaginous. The example of locations for each were also accurate.

The locations seemed to create the main confusion with the learners and often they would chose to state the name of a bone that forms at an example of that joint.

Some learners also stated the names of synovial joints in the first column which received no credit as the question was asking about joint classification as per the unit content.

Q2(a)

The responses for this had a largely consistent approach. A high proportion of learners were confident in providing a meaning of the 'anterior' as to the front of the body

2 Give the meaning of the following anatomical terms.

(a) Anterior

To the front / in front.

1

This response gained 1 mark

Q2(b)

The responses for this had a had an equally consistent approach. A high proportion of learners were confident in providing a meaning of the 'lateral' as away from the midline or centre of the body

(b) Lateral

(1)

away from the midline of the body.

(Total for Question 2 = 2 marks)

This response gained 1 mark

Q3.

This question assesses an area of D1 that learners may not have seen assessed before. It is worth noting to all centres that all areas of the unit content can be assessed within this examination. The question was not attempted by a high proportion of learners. Those who chose to attempt were confused with 'protection of vital organs' and or 'the process of bone growth'.

The learners who achieved two marks were able to correctly identify the function of tuberosity to provide attachment to connective tissue such as muscles and tendons. Learners were then able to gain a second mark for knowing that this bony landmark is evident as a raised bump/elevation/protrusion at the end of a bone

A tuberosity is an example of a bony landmark.

3 Describe the function of a tuberosity.

Q03

Tuberosity is a large rounded bump (prominence) which creates an area for muscles attachment. Muscles attach here which is crucial for movement.

(Total for Question 3 = 2 marks) Q03_Tota

A tuberosity is an example of a bony landmark.

3 Describe the function of a tuberosity.

raised

Q03

A tuberosity is a rough, raised surface on the bone that allows muscle attachment.

Both of these responses gained 2 marks

They accurately state the function as 'muscle attachment' as the landmark is a raised area (bump/prominence).

A tuberosity is an example of a bony landmark.

3 Describe the function of a tuberosity.

A tuberosity is ~~where~~ ~~the~~ part of the skeletal system.

A tuberosity is where the bony framework, the (mineral) store of minerals and protection of (organs) vital organs take place.

(Total for Question 3 = 2 marks)

This response gained 0 marks

This response is very typical of responses seen in this series. Learners linked the function to structure, framework or protection of vital organs.

Q4

This question asked learners to describe the term pronation. There are many types of movement listed in E5 of the unit content. This question is an example of movements that may not get assessed in the extended questions and could consequently be assessed as short answer questions like this one.

The response required by the learners was to identify that pronation takes place in the hand to face downwards when the elbow is flexed. There were occasional responses about pronation of the foot which were given credit if accurate as per the mark scheme.

Some learners provided descriptions of a 'prone' position as this is covered in A1 of the unit content. This was accurate for one marking point 'facing downwards' however they were required to describe where pronation occurs in order to access the full 2 marks.

4 Describe what is meant by 'pronation': C

Pronation is the downwards ^{rotation} movements of your forearm where your palms end up facing downwards (to the floor).

This response gained 2 marks

The learner has described where it happens (palm) and that the rotation will be, so it is facing downwards.

4 Describe what is meant by 'pronation':

Pronation is something that is facing down towards the ground. An example if you are your front you are in a pronation position.

(Total for Question 4 = 2 marks)

This response gained 1 mark

The learner has described the anatomical term 'prone'. This was credited 1 marking point for facing down towards the ground. There was no description of where pronation takes place for the second marking point.

Q5

This question asked learners to describe the plane of movement being using during a cartwheel movement.

The response required by the learners was to identify the frontal plane and then provide two additional and linked descriptive points, such as how the plane divides the body and therefore allowing sideways movement or abduction/adduction movements.

Figure 1 shows a cartwheel.



Figure 1

5 Describe the plane of movement used during a cartwheel, as shown in Figure 1.

During the cartwheel the person is seen doing the move in the frontal plane as the arms and legs stay in the same position, but ~~move~~ perform a movement.

This response gained 1 mark

This learner was able to identify the frontal plane.

5 Describe the plane of movement used during a cartwheel, as shown in Figure 1.

The plane of movement ~~is~~ used during a cartwheel is frontal because during a cartwheel you use the types of movement of abduction and adduction.

This response gained 2 marks

The learner identifies the correct plane of movement and links the plane to abduction and adduction movements as seen in the cartwheel.

5 Describe the plane of movement used during a cartwheel, as shown in **Figure 1**.

The plane of movement used in figure 1 is the frontal plane, which divides the body into front and back (anterior and posterior). This is used in the cartwheel as abduction and adduction movements of the limbs are occurring.

(Total for Question 5 = 3 marks)

This response gained all 3 marks

This was typical of those learners accessing full marks on this question. They identified the correct plane (1) and provided two linked descriptive points; divides the body into front and back (1) for abduction and adduction movements (1). Some learners would refer to sideways movement or state the plane moving through the body as a lateral line. Both of which also received credit.

Q6a

This question was a highly accessible question and assessed learners' knowledge and understanding of the heart anatomy.

Figure 2 shows the heart.

6 (a) Identify the components labelled A, B and C. (3)

Figure 2

This response gained 3 marks

All 3 components have been labelled correctly.

Figure 2 shows the heart.

6 (a) Identify the components labelled A, B and C.

(3)

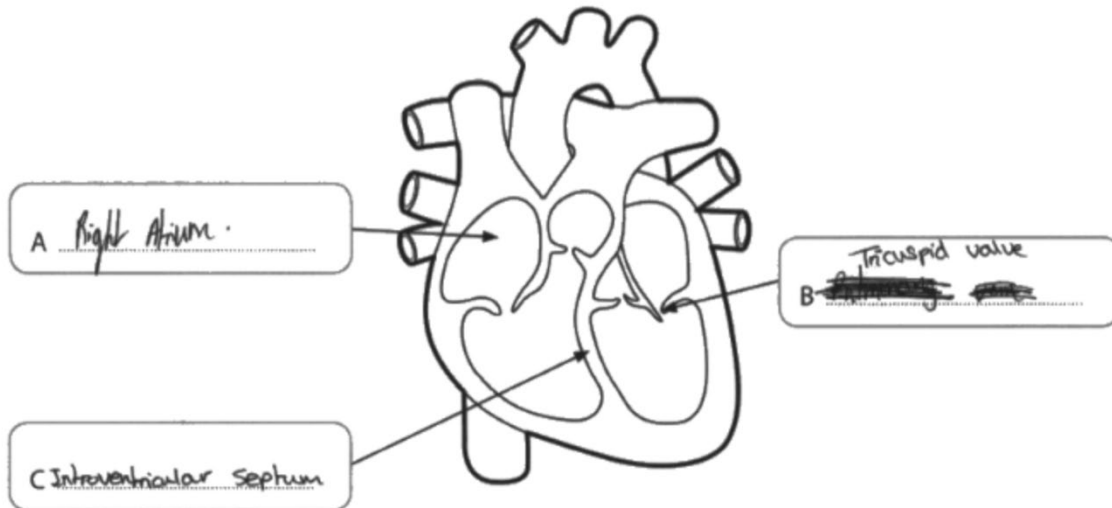


Figure 2

This response gained 2 marks

There were varied responses from learners in this question for the component B. As you can see in this response the learner has labelled the incorrect valve.

Q6b

This question was linked to the heart anatomy and assessed learners' knowledge of the function of the semilunar valves.

The command verb is describe. Therefore, to achieve full marks, learners are required to identify the function and expand their answer with a linked descriptive point. The function of 'preventing backflow' was answered well at all levels for most learners. However, the second marking point was not accessed as highly as a high proportion of learners were unable to link the correct direction of blood flow/back flow between the ventricles and the aorta/pulmonary artery.

(b) Describe the function of the semilunar valves located in the heart. (2)

The Semi Lunar Valves are located in front of the entrance of the Aorta, their function is to stop the backflow of blood travelling back into the left ventricle.

(Total for Question 6 = 5 marks)

This response gained 2 marks

This learner has accessed both marking points; to prevent back flow (1) back into the left ventricles from the aorta (1)

(b) Describe the function of the semilunar valves located in the heart. (2)

The tricuspid and bicuspid valve are important for preventing backflow of blood within the heart and to operate as an entrance for blood from the atrium to the ventricle.

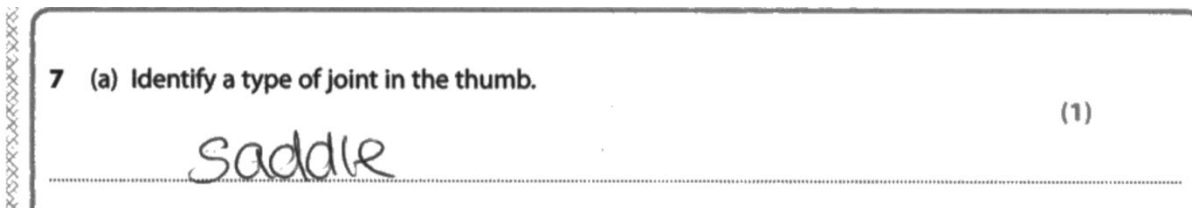
(Total for Question 6 = 5 marks)

This response gained 1 mark

This is very typical of the type of response seen for this question. The learner is able to access a mark for describing the key function; preventing backflow. The valves referred to and further described are not the semi lunar valves and therefore no further credit was awarded.

Q7a

This question was a highly accessible question and assessed learners' understanding of the joint that is located in the thumb. The majority of learners answered with 'saddle', a small proportion opting for a 'hinge joint'. There was some confusion with 'condyloid' and 'gliding' joints.

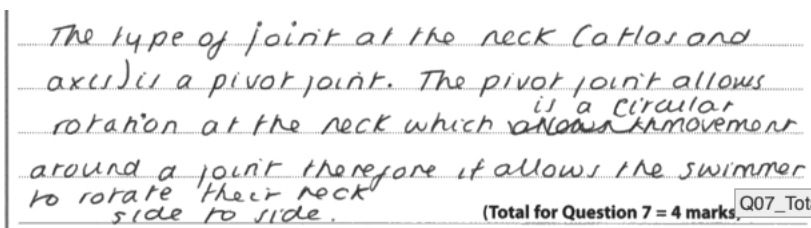


This response gained 1 mark

Q7b

This question asked learners to explain why the type of joint in the neck allowed a swimmer to breathe whilst completing the front crawl.

The command word was explain so the response required by the learners was to identify the correct type of joint (pivot) and then provide two additional and linked explained points, that the joint allows some rotation as it is structured as two circular bones which fit over one another. Those learners who accessed all marks were able to access the third marking point by explaining these were the atlas and axis bones situated in the neck.



as shown in figure 3.

(pivot)

(3) Q07b

The neck is a pivot joint. A pivot joint allows rotation, which is why the swimmer is able to move their head as shown. The joint is found between C1 and C2, atlas and axis. ~~There~~ There are rings of cartilage between the vertebrae which reduce friction as movement takes place.

(Total for Question 7 = 4 marks, Q07_Total)

These responses gained 3 marks

Both these responses demonstrate how all 3 marks were accessed. The joint was correct and linked accurately to rotation. The third marking point is clear as they have also explained using the atlas and axis bones of the vertebrae.

Figure 3 shows a swimmer taking a breath when swimming the front crawl.



Figure 3

(b) Explain why the type of joint in the neck allows the swimmer to move their head, as shown in Figure 3.

(3)

The type of joint in the neck is pivot it allows the swimmer to move their head side to side as they breathe for air. Pivot is the best type of joint for this swimmer

This response gained 1 mark.

There are no linked explanatory points, but the learner has correctly identified the correct joint in the neck.

The type of joint in figure 3 is a ball + socket joint. This joint allows a wider range of movements such as rotation unlike a hinge joint. Therefore this rotation allow the swimmer to move their head. (Total for Question 7 = 4 marks)

This response gained 0 marks.

Some learners did not access any marks as the incorrect type of joint was explained and linked to the swimmer.

Q8

The command verb for this question is describe. Consequently, in order to gain full marks, learners should provide a logical description of how the external intercostal muscles function during inspiration.

This question was designed to be accessible but with sufficient scope to stretch and challenge learners to apply their knowledge and understanding of this part of the unit content. There were some excellent answers. However, the responses to this question were varied and, on the whole, showed a confident application of the process involved with inspiration. Some learners would refer to the diaphragm which was not creditworthy as the question was specifically asking about the respiratory muscles; external intercostal muscles.

8 Describe the function of the external intercostal muscles during inspiration.

Q08

The external intercostal muscles during inspiration are contracting, forcing the ~~low~~ thoracic wall / ribs upwards and outwards. This expands the thoracic cavity in volume which causes the atmospheric pressure to be lower on the inside than out which encourages oxygen to be drawn in to the lungs.

(Total for Question 8 = 4 marks, Q08_Total)

This response gained 4 marks

This learner shows that the external intercostal muscles are required to contract (1) forcing the ribs upwards and outwards (1) to increase the volume of the thoracic cavity (1) lowering the pressure inside the lungs (1). There was an interchangeable nature of the responses within the mark scheme and had the learner missed one of the above the last part of the response; drawing oxygen into the lungs (1) would also be creditworthy.

8 Describe the function of the external intercostal muscles during inspiration.

During inspiration the external intercostal muscles allow the volume in the chest to increase which allows the body to take a larger amount of air in so there will be more oxygen taken in ~~from~~^{for} the ~~rest~~ muscles so that the body doesn't have to work as much when taking oxygen in multiple times where they make it possible to take one large breath.

(Total for Question 8 = 4 marks)

This response gained 2 marks.

This response also demonstrates some application from an interchangeable mark scheme. The learner shows understanding of the volume of the chest cavity increasing (1) to take in more oxygen (1).

8 Describe the function of the external intercostal muscles during inspiration.

The external intercostal muscles are ^{contracting} ~~being~~ during inspiration, where they are ~~are~~ pushed outwards to open up the lungs more. These intercostal muscles help us breathe in. This muscle lengthens and moves outwards so we can inspire more.

(Total for Question 8 = 4 marks)

This response gained 1 mark.

The learner has described that the muscles need to contract (1). They have not made it clear what is pushed outwards as a result of this contraction. There are no other descriptive points as per the mark scheme.

Q9

This was an area of the specification not been assessed other than sample assessment materials. Consequently, the command word was describe so learners could access the many descriptive points which are accurate for the functions and processes of the lymphatic system.

There was a continuum of answers. In summary the question was either not attempted or learners demonstrated some excellent responses showing sound understanding of the importance of this system to fight infection and remove waste products. When attempted and at pass level, learners would describe the system using white blood cells to fight infection.

Those learners accessing a higher mark range explained the use of lymph acting as a drainage system to support the immune system to fight infection and remove bacteria/pathogens/toxins.

Similar to question 8, the mark scheme was interchangeable to allow learners to access credit for knowledge and understanding of this system.

9 Describe the function of the lymphatic system.

The lymphatic system works well with the immune system. This system gets rid of any toxins or harmful substances in the body that may be there. For example the white blood cells carried in the blood kill pathogens. Lymph is also transported through the blood. Lymph contains red and white blood cells and help with this process. The lymphatic system is almost a drainage system.

(Total for Question 9 = 4 marks)

This response gained 4 marks

The response has started linking with the immune system (1), to get rid of toxins (1), using white blood cells (1) and transporting lymph (1).

9 Describe the function of the lymphatic system.

The lymphatic system carries a colourless fluid around your body called lymph, this help get rid of bacteria and can also fight infection.

This response also gained 4 marks

9 Describe the function of the lymphatic system.

The ~~lymphatic~~^{lymphatic} system releases a fluid containing white blood cells which helps the removal of waste products out of the body.

(Total for Question 9 = 4 marks)

This response gained 2 marks

This response is very typical of responses achieving just 1 or 2 marks when attempted. Learners would show an understanding of using white blood cells (1) to fight infection. In this instance a second marking point is awarded for knowing the system removes waste products (1).

Q10

Responses to extended answer questions are marked using levels-based mark schemes, with the quality of the response determining the level. There are four levels; level 0 where there is no rewardable material presented and then levels 1, 2 and 3; the higher the level the better the quality of response.

This question uses the command verb analyse. This requires learners to examine a topic in detail, breaking it down into its component parts and explaining how each part contributes to the other, and in this instance allows an athlete to take part in exercise.

The question asks learners to analyse three **other** functions of the cardiovascular system as one was stated in the rider statement of the question; vasodilation and vasoconstriction to control blood flow.

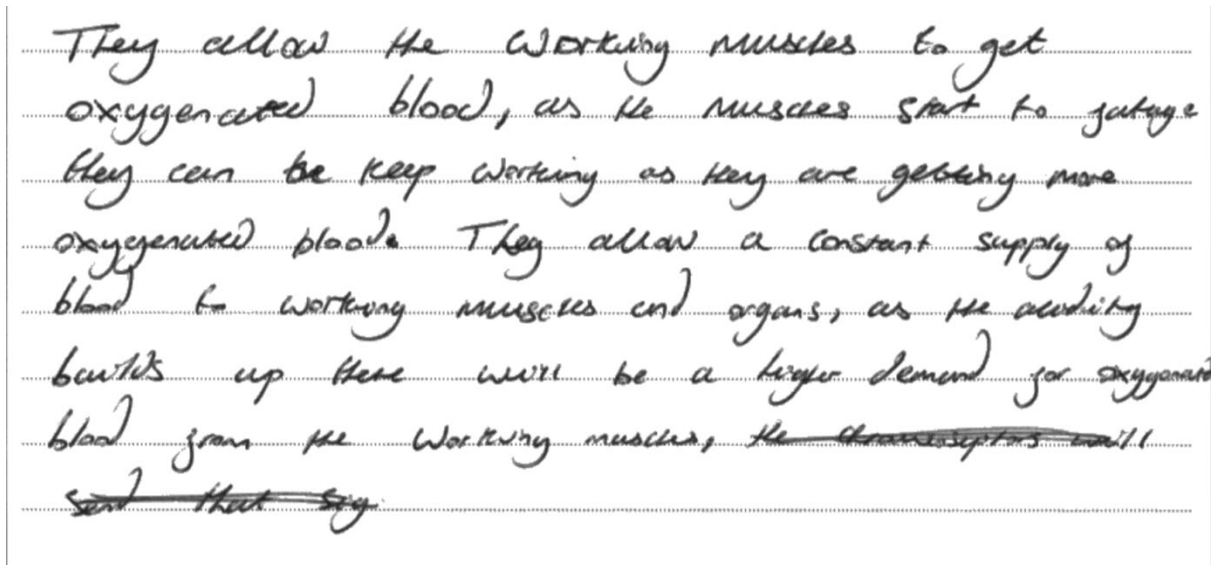
Control of blood flow through vasoconstriction and vasodilation is **one** of the functions of the cardiovascular system. This function allows an athlete to take part in exercise.

10 Analyse **three other** functions of the cardiovascular system that allow an athlete to take part in exercise.

There were many learners who attempted the question analysing vasodilation and vasoconstriction and were not credited as this function has already been stated in the question. However, there were some excellent answers, breaking down in accurate detail with a relevant description three other functions from the unit content.

The link to being able to take part in exercise is where differentiation between level 2 and level 3 responses occurred.

This was typical of a level 1 response.



They allow the working muscles to get oxygenated blood, as the muscles start to fatigue they can be keep working as they are getting more oxygenated blood. They allow a constant supply of blood to working muscles and organs, as the activity builds up there will be a larger demand for oxygenated blood from the working muscles, the ~~transmitters~~ will ~~send that sig~~.

This response gained 2 marks

This response is typical of a basic level 1 response. It was response seen regularly amongst pass learners within the series and it was clear learners were able to show isolated knowledge of one function; supplying oxygenated blood to the muscles (1). This learner does link this to requiring higher demand for oxygen from the working muscles during exercise, but it remained as a level 1 response as no other functions were analysed.

Another function of the cardiovascular system would be the tie between the neural control from the Sinoatrial Node, Atrioventricular node, Bundle of His and the Purkinje fibres. These allow the contractions to happen in the heart from electrical impulse from the brain.

This is an extract from a learner response which was typical of responses not accessing any marks in this question. Learners opted to analyse the cardiac cycle or gaseous exchange, both of which are not functions of the cardiovascular system as listed in B2.

10 Analyse **three other** functions of the cardiovascular system that allow an athlete to take part in exercise.

Q10

One of the main functions of the cardiovascular system is the transportation of oxygen ~~and~~ and nutrients. When the oxygen is breathed in, gaseous exchange takes place at the alveoli, this is where the oxygen diffuses into the capillaries and into bloodstream. ~~The~~ The oxygen is transported around the body in red blood cells, and then ~~#~~ to the working muscles to create energy.

Another function of cardiovascular is to help fight infection. ~~The~~ This is through the use of white blood cells. White blood cells help to fight away bacteria and kill pathogens.

Blood clotting is another main function of the cardiovascular. This is when there is either internal or external bleeding, the ~~the~~ blood will then clot in order ~~to~~ for bleeding to stop. This is when the blood dries up and prevents any more blood from passing through the vessels, preventing blood loss.

(Total for Question 10 = 8 marks)

Q10_Total

This response gained 7 marks

This is an example of a fairly typical level 3 response seen in this series. The learner has analysed three other functions; transportation (delivery) of oxygen and nutrients, fighting infection and blood clotting.

They have referenced accurate material from the indicative content to demonstrate understanding of each function.

There is no link to exercise for fighting infection and blood clotting. However, the learner has linked oxygen delivery and transportation to creating energy at the working muscles. This application point ensures the response accesses level 3.

Q11

This is another extended answer question using a levels-based mark scheme. Learners achieved a good spread of marks for this question. The most accessible marks here were for knowledge of the types of joint involved and the articulating bones at these joints.

A number of learners found the trunk more challenging to analyse. Planes of movement for all three joints presented the challenge in this question. Accurate analysis of the correct plane differentiated between learners and was credited accordingly.

Almost all learners achieved at least marks in the Level 1 grade descriptor for this question. A good proportion of learners demonstrated a sufficient breadth and depth of accurate knowledge and understanding to achieve marks from the Level 2 grade descriptor. It was promising to see a high proportion of learners providing a full analysis that demonstrated sustained knowledge of interrelationships and linked these to the context of the question in order to get into the Level 3 grade descriptor.

A very small number of learners still made reference to the muscular system detailing antagonistic muscle pairs and the types of contraction taking place in each. It was positive to see that centres and learners are however not doing this and responding to lead examiner report. The question only asks about the axial and appendicular skeletal system so no credit could be awarded for parts of the learner responses related to the muscular system. The space provided to answer this question should be a guide of the amount of detail the learners are expected to include.

The trunk, which is part of the axial skeleton is a cartilaginous/gliding joint. It's articulated by the vertebrae. From preparation to execution phase, the gymnast's trunk is going through lateral flexion, through a frontal plane.

The left hip, which is a part of the appendicular skeleton is a ball and

socket joint. It's articulated by the femur and the pelvis. From preparation to execution phase, the gymnast's left hip is abducted through a frontal plane.

The left ankle, which is part of the appendicular skeleton is a hinge joint. It's articulated by the tibia, fibula and talus (tibia tarsals). From preperation to execution phase the gymnast's left ankle is ^{plantar flexed} ~~extended~~ through a sagittal plane.

This response gained 8 marks

Learner has provided a full analysis for all 3 joints. The type of joint, articulating bones, joint and plane of movement are all evident and contextualised for the stretch. The learner has shown good linkage and integrated the correct plane for all three joints. The identification of lateral flexion and the frontal plane at the trunk were credited accordingly as these were the more challenging analysis required.

This response also demonstrates how full analysis can be achieved in three concise paragraphs which focus on the execution phase only.

At the left ankle, the possible movements are plantarflexion, dorsiflexion and rotation. The fibula, tibia and tarsals are working together to create plantarflexion from the preperation phase to the execution. The ~~ankle~~ ^{soleus} external obliques ^{is} contracting concentrically around the ^{guiding} hinge joint. the ~~erector~~ spin This is happening along the sagittal plane.

At the left hip, the possible movements are flexion, extension, hyperextension, adduction and abduction.

The femur, ischium and pelvis are working around the ball and socket joint to create adduction. The external obliques are contracting concentrically to allow this movement. This is happening along the sagittal plane.

At the trunk, the possible movements are flexion, extension and hyperextension. The pelvis and vertebrae are working together to create flexion at the hinge joint. The abdominals and external obliques are contracting for this to happen. This is happening along the sagittal plane.

This response gained 4 marks

The ankle joint is analysed accurately with the articulating bones, types of movement and plane of movement. Identifying the 'sagittal' plane demonstrates relevance to the stretch and credited accordingly. The type of joint is incorrectly analysed.

The hip joint analysis includes the type of joint, articulating bones and type of movement. The plane of movement is inaccurate.

Finally, there is limited analysis of the trunk with only the articulating bones analysed.

It is mostly accurate knowledge and the contextualisation varies, therefore demonstrating a level 2 response. It is clear from this highlighting and annotation that any muscular system analysis is not required for this extended question.

Q12

This question is intended to be one of the most demanding on the paper. The question requires learners to analyse the movement of the elbow, shoulder and knee to achieve the position shown from preparation phase to execution phase ascending up an indoor climbing wall.

Again, learners seem to have been prepared to answer movement analysis questions and have plans and systems in place to help them do so.

A high proportion of learners have delivered a structured response based on a pre-planned strategy, often shown by tables that were drawn at the start of the learners' response or the diagram being annotated.

A number of factors make this question accessible with suitable stretch and challenge to learners. All joints have been assessed before and generally learners accurately analysed the two types of joints involved at the elbow and the knee, the articulating bones and the joint movements. A number also included the correct antagonistic muscle pairs, types of contraction or planes of movement and this was written in a succinct analysis with only focus on the execution phases as requested by the question.

The antagonistic muscle pairs at the elbow and knee were stated, although occasionally the agonistic pairing was analysed the wrong way around with eccentric muscle contraction provided. The muscles, movement and plane of movement involved at the shoulder seemed to prove slightly more challenge to learners. Similar to Q11, where these were identified they were credited accordingly.

Some learners still delivered a response that tackled an analysis of the position at preparation followed by another full analysis of the position at execution, rather than addressing the movement between the two phases.

A pleasing number of learners were able to accurately analyse with the sufficient detail as per the mark scheme most of the component parts that are working together to allow the climber to reach high from preparation to execution and achieved marks in the level 3 grade descriptor.

The knee is a hinge joint, the articulating bones that form the knee joint are the femur and tibia. From preparation to execution the performer goes through extension to flexion which is performed along a sagittal plane. In order for the rock climber to cause flexion at the knee they ~~agonist~~ ^{need to use the} antagonistic pairs ^{at the knee} are the hamstrings (which are the agonist) and the quadriceps (which are the antagonist). The hamstrings contract and bulge which causes the tibio femoral joint to

decrease and the quadriceps relax whilst still under tension to stabilise the joint.

This movement allows the performer to move his leg onto a higher platform. ~~sa~~ The type of contraction is a concentric contraction as the muscle contracts under tension.

The shoulder is a ball and socket joint. The bones that articulate to form the shoulder are the humerus, scapula and clavicle.

The shoulder is multi-axial however from preparation to execution the rock climber performs abduction which is performed along a frontal plane. The ~~rock climber~~ ^{antagonistic} pair that causes abduction at the shoulder are the medial deltoids (agonist) and the latissimus dorsi (antagonist). The rock climber's medial deltoids would contract ^{and bulge} causing the deltoid to pull on the ^{insertion at the} humerus and at the same time the latissimus dorsi relaxes and lengthens under tension in order to allow the medial deltoid to contract. This allows the climber to ~~re~~ fully extend his arm so that they can reach the next groove or platform ^{above him}. This contraction is a concentric contraction as the muscle ~~moves~~ ^{contracts} under tension.

The elbow is also a hinge joint ^{and therefore is uni-axial}. The articulating bones that form the hinge joint at the elbow are the humerus, radius and ulna. The elbow is uni-axial and therefore from preparation to execution the performer can ~~only~~ ^{only} perform ^{one range of movement} flexion to extension. This movement occurs along a sagittal plane. The antagonistic pairs that cause this movement are the triceps (agonist) and biceps (antagonist). The triceps contract and bulge which pull on the insertion at the radius and ulna and at the same time the biceps relaxes and lengthens under tension to allow the rock climber to extend his arm to allow ~~them~~ ^{him} to reach the next platform / groove. This contraction from preparation to execution is a concentric contraction. as the ~~muscle~~ ^{muscle} triceps contracts under tension.

This response gained 14 marks

This is an example of a learner who has opted to analyse just the execution phase. The learner demonstrates full analysis of each joint breaking down each component into equal parts and linking to the context of the rock-climbing movement. Therefore, it receives a mark which represents a level 3 grade descriptor.

The right knee is a hinge joint formed by the articulation of the femur, patella, tibia & fibula. The knee goes from being in an extended position to being flexed during execution. The working antagonistic pair is the quadriceps and hamstring, where going into the execution phase, the quadriceps becomes the antagonist, lengthening and relaxing, as it allows the hamstring to be the agonist, contracting and shortening. The hamstring is concentrically contracting as it shortens, being the moving action as it allows the climber to flex at the knee, enabling him to

The right shoulder is a ball + socket joint, formed by the articulation of the humerus, clavicle and deltoid. The right shoulder stays extended as it is lifted from the body in both preparation and execution, however it goes from being abducted to being in a horizontally abducted position. This occurs as the climber is horizontally reaching out to reach the step. The antagonistic muscle pair used in this action is the bicep and tricep. Going into the execution stage the bicep becomes the agonist as it is now concentrically contracting and shortening, to allow the arm to straighten out and reach up. Therefore the bicep is now the antagonist, when the arm is straight. Relaxing and lengthening to allow the tricep to contract.

The right elbow is a hinge joint, only allowing flexion and extension to occur, which is formed by the articulation of the humerus, radius and ulna. The elbow goes from being in a flexed position, to being extended, during execution, as the arm is straightened out. The muscles used are the biceps and triceps. Working as the agonist in the execution stage, the bicep contracts and shortens to allow the elbow joint to

stay extended. This now **concentrically** contracts as it is in the moving action until the climber comes back down, flexing at the elbow, where it will now be eccentrically contracted, lengthening and being the control mechanism. The extended position now allows the climber to use his **bicep as the antagonist** as it relaxes and lengthens, working to allow the bicep to contract, causing the action.

This response gained 9 marks

This response demonstrates some accurate knowledge as per the level 2 descriptor.

Knee; the learner has completed an almost full analysis, but the plane of movement is omitted.

Elbow; likewise, the learner has completed full analysis and missing the plane of movement.

Shoulder; limited analysis and only stating the correct type of joint and movement to ascend the wall.

This response shows the complexity of the shoulder analysis to differentiate amongst learners but also how full analysis can be achieved on two other joints. It is worth noting, for this movement learners were credited for either abduction of the shoulder in the frontal plane or flexion of the shoulder in the sagittal plane. Both of these movements can be applied to the climber in the execution phase.

Summary

Based on their performance on this paper learners are offered the following advice:

- Recognise that this paper is assessing knowledge of anatomy. Whilst an understanding of general principles and functions of the body is required, the majority of the marks on this exam are awarded for detailed anatomical knowledge. This will usually include the location, and structure of the component parts of the systems included in the specification, and their specific role in the functions of those systems.
- Recognise that all areas of the unit content can be assessed, and it is worth noting any gaps of topics not yet examined.
- Read all questions carefully to ensure full understanding of what is being asked.
- Identify keywords in a question - possibly underline or highlight these to draw attention to them.
- Understand the different command verbs (e.g. describe, explain, analyse) in order to establish the requirements of each question.
- Understand terminology used in the specification as these words will be repeated in the exam paper.
- Use appropriate technical language throughout responses as this will support the demonstration of accurate anatomical knowledge.
- Use the number of marks as a guide to the depth of response required.
- Refer to the previous exam papers in order to become familiar with the structure of the exam and expected responses, particularly for question 11 and question 12.
- In question 11 and 12, continue to focus on the movement from the preparatory phase to execution phase of the movement for analysis and use this report to appreciate what is required for full analysis for each joint asked in the question.
- In question 12 ensure analysis includes the correct agonist and antagonist muscle, in the correct order to create the movement required at the joint.

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