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Examiners' Report/
Lead Examiner Feedback

June 2018

BTEC Level 3 Nationals in Sport and 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 (Distinction, Merit, Pass and Near Pass). The grade awarded for each unit contributes proportionately to the overall qualification grade and each unit should always be viewed in the context of its impact on the whole qualification.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the 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 should be 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 test 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 test, because then it would not take into account that a test might be slightly easier or more difficult than any other.

Grade boundaries for this, and all other papers, are on the website via this link: qualifications.pearson.com/gradeboundaries

Unit 2: Functional Anatomy

Grade	Unclassified	Near Pass	Pass	Merit	Distinction
Boundary Mark	0	10	19	28	38

Introduction

This is the second series of external examinations with regards to the new specification. The method of assessment was via examination as opposed to centre based internal assessment as employed within the old specification.

Centres and learners should be acknowledged for their preparation. There were some changes to the assessment format from the first series. 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 5 marks, whilst question 10 to 12 ranged from 8 to 14 marks gained; 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. There were some changes to these questions with an overall reduction of ten marks. Questions 10 and 11 were reduced from ten marks each in the previous series to eight marks each this time. While Question 12 was reduced from twenty marks in the previous series to 14 marks this time.

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.

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 one mark for identifying a function of articular cartilage. This was commonly 'to prevent friction' as shown in this typical response.

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

1 Describe the function of articular cartilage. 1 Q01

articular cartilage is attached at either side of bones at a joint. The function is to reduce friction and stop the bones from meeting.

(Total for Question 1 = 2 marks) **1**

This response gained 1 mark

A number of learners were able to access two marks for correctly providing a linked descriptive point.

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

1 Describe the function of articular cartilage. 2 Q01

To prevent friction between the bones, it also acts as a shock absorber.

(Total for Question 1 = 2 marks) **2**

This response gained 2 marks

Q2(a)

This question was answered well, with a high proportion of learners gaining one mark for giving the meaning of the anatomical term supine. Responses that gained credit included ;

- Lying on your back
- Palms facing upwards
- Facing upwards

2 Give the meaning of the following anatomical terms.

(a) Supine

when the body is lying horizontally facing up

(1) 1 Q02a

This response gained 1 mark

One mark gained for correctly stating 'facing up'

Q2(b)

The responses for this question varied much more than the consistent approach in 2a. It was expected that learners should have achieved one mark for this question for giving the meaning of the anatomical term proximal. A relatively high proportion of learners accurately gave an answer referencing;

- Towards/near/close to the midline/centre of the body
Or
- At the point of attachment/origin

(b) Proximal

Near / towards the origin

(1) 1 Q02b

This response gained 1 mark

(b) Proximal

~~below is above the~~ is close to the main body

This response gained 0 marks

This learner demonstrates a common error in that 'Main' part of the body was too vague to gain credit. In order to gain credit, a learner is required to refer to midline or centre of the body.

Q3

This question was very accessible to learners. The vast majority achieved one mark for correctly identifying the function of the tricuspid valve. The common approach was to describe that the valve 'prevents backflow of blood'. Some learners were then able to gain a second mark for a further correct expansion. This expansion was mainly the location of where backflow is being prevented from and to i.e. right ventricle to right atrium. This is demonstrated in the first sentence in the response below.

3 Describe the function of the tricuspid valve.

2 Q03

The tricuspid valve prevents the backflow of blood between the right ventricle and right atrium. It is helped by chordae tendons to prevent blood travelling back into the right atrium from the right ventricle.

(Total for Question 3 = 2 marks) **2**

This response gained 2 marks

3 Describe the function of the tricuspid valve.

2 Q03

The tricuspid valve is located between the right atrium and ventricle as it opens when the atria contracts letting deoxygenated blood through to the ventricle. It also prevents the backflow of blood.

(Total for Question 3 = 2 marks) **2**

This response gained 2 marks

This learner response also gained 2 marks. One mark for the valve 'opening when the atria contracts' and a further mark for 'letting blood to flow into the ventricle' as per the mark scheme.

It is worth noting here that without the second mark this response would still access 2 marks as there could be a combination in the mark scheme. The learner had also mentioned to prevent backflow of blood which could have qualified for a further mark.

3 Describe the function of the tricuspid valve.

1 Q03

This is to stop the backflow of blood back into the left Atrium from left ventricle

(Total for Question 3 = 2 marks) **1**

This response gained 1 mark.

This learner has correctly stated that the valve stops backflow to be credited 1 mark. A high proportion of responses referred to the wrong side of the heart. This was a common error as shown in this response.

Q4

This question asked learners to identify a fixed/fibrous joint, use an example and provide two descriptive points.

This question was unanswered by a high number of learners.

When answered, a proportion of learners were able to identify a fixed/fibrous joint and give an example. Most correct responses included cranium or skull as their example. If an example was omitted, the common second mark was knowledge of the joint providing 'no movement'

4 Describe, using an example, the third classification of a joint.

The third joint is the fixed joint where the movement of the bones are unable to move at all. One example of this is the cranium which protects the brain, a vital organ for the body to function, which is why the cranium must not be able to move at all as it can leave the brain to be exposed.

This response gained 4 marks

This learner accessed all 4 marks. The type of joint is identified with further expansion of 'not being able to move'. The learner continues to provide an appropriate example and then expands to show knowledge that this joint is important to protect the brain.

4 Describe, using an example, the third classification of a joint.

Fibrous, these joints are fixed like the coxix and provide a fixed bone with no movement. They are very hard and strong. In adults they aid red blood cell production

This response gained 2 marks

For two marks, this learner identified the correct type of joint. They have expanded upon this identification by stating 'no movement'.

There are three classifications of joint. Synovial and cartilaginous are two of these classifications.

3 Q04

fibrous fixed

4 Describe, using an example, the third classification of a joint.

The third classification of joint is the fibrous joint. Also known as a fixed joint. These can be found in the vertebrae in the back. They are at the bottom of the cranium. They are known as fibrous or fixed joints because they don't move. Unlike synovial and cartilaginous joints

This response gained 3 marks

The learner has identified fibrous/fixed joint movement. They have expanded with an accurate example and further expansion as explaining 'they don't move'.

Q5

This question assessed the learners' knowledge and understanding of isometric muscle contraction.

The question was applying knowledge of the muscular system as learners were provided with a wall sit movement. The command verb for this question is explain. To gain full marks learners are required to identify the correct muscle contraction and provide two further appropriate expansion points.

There are some accessible marks here whilst providing suitable level of stretch and challenge and a high proportion of learners managed to gain at least one mark for correctly identifying isometric muscle contraction.

5 Explain the type of muscle contraction used to hold this position.

The type of muscle contraction used to hold ~~that~~^{this} position is concentric, this is when the muscles lengthen. In this figure the persons hamstrings will be lengthening.

This response gained 0 marks

Concentric muscle contraction is not awarded credit as the diagram and question stem showed a person 'holding' the position so concentric contraction was not accurate.

5 Explain the type of muscle contraction used to hold this position.

Muscle contraction is isometric contraction. It is isometric as she is in the squat position which means her muscles are contracting and causing tension are ~~not~~ staying the same length, they are not getting made longer or shorter when a contraction is occurring.

(Total for Question 5 = 3 marks) **3**

This response gained 3 marks

This learner has identified the correct muscle contraction. The subsequent expansion points are in line with the mark scheme; tension occurring (1) whilst staying the same length (1).

A common response for 2 marks was identification of isometric with the expansion about the muscles not shortening or lengthening.

Q6a

This question was a highly accessible question and assessed learners' knowledge and understanding of three parts of bone anatomy.

Figure 2 shows the anatomy of a long bone.

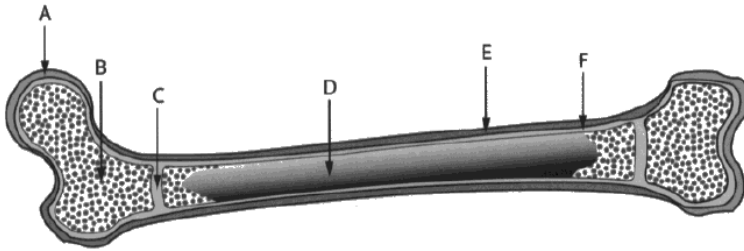


Figure 2

- 6 (a) Identify which letters in **Figure 2** show the location of the cancellous bone, periosteum and growth plate.

(3) Q06a

Cancellous bone

B

Periosteum

E

Growth plate

C

This response gained 3 marks

The locations in this response are correctly identified.

There were varied responses from learners in this question and knowledge on the bone locations were on occasion inaccurate.

Q6b

This question assessed learners' knowledge and understanding of bone growth and the growth plate. This question had some accessible marks for learners, but they appeared to be much more challenging to achieve. The command verb is describe. Therefore, to achieve full marks learners are required to identify a function of the growth plate and then expand their answer with linked descriptive points.

(b) Describe the function of the growth plate.

(3) 2 Q06b

A growth plate / epiphyseal plate has the function of growing the length and strength of the bone. At a young age specifically when children are growing, the growth plate has osteoblasts that produce the hard tissue to grow the bone, and mature cartilage in the ossification process.

This response gained 2 marks

This learner has access the first marking part by stating the growth plate function is to increase the length of the bone. Learners typically demonstrated knowledge of the function of 'growth of a bone' but as this was in the question stem the mark was accessed when the learner described this as getting longer or increasing in length, as seen in this response. The second marking point in this response is clear as the learner has displayed understanding of the ossification process linked to the function. The learner clearly recognises the growth's plate function occurs in young age. In order to access full marks for this question the learner was required to expand further on this and link the function to preventing further growth when at full maturity. The learner in the response below displays how that marking point was accessed.

(b) Describe the function of the growth plate.

(3) 2 Q06b

During childhood and adolescence, the growth plate allows the length of the bone to be increased. When growth of the bone is no longer needed, the growth plate fuses together, preventing further growth.

This response gained 2 marks

The learner identified the function 'allows the length of bone to be increased'. Further credit is awarded for showing that when it is no longer needed 'it prevents further growth'.

(b) Describe the function of the growth plate.

(3) Q06b

The growth plates are responsible for the lengthening of long bones, cartilage is pushed towards the middle of the bone but is then replaced by bone tissue when it dies. They then fuse into bone when the bone is at its full length.

This response gained 1 mark

This learner has accessed the mark for the function by correctly stating they 'are responsible for lengthening of long bones'

(b) Describe the function of the growth plate.

(3) Q06b

The growth plate allows the bones to grow. This is where eventually after fully developing they will connect to the bones around it and make it stronger.

This response gained 0 marks

This was a common response where a learner stated the function of growth, but no credit was given as it required further description. Often learners would refer to become 'bigger' and, 'stronger', 'which was insufficient detail and accuracy to gain credit at

Commented [WU1]: We don't really need to state the level as it implies that is would be accepted at other levels but the report is not really to compare what is permitted across different quals/levels.

Q7

This question used an image of an ice skater during a spin and had some very accessible marks for learners, but also one mark that were more challenging to achieve. The command verb is describe. Therefore, to achieve full marks learners are required to identify the correct plane of movement and then support their answer to describe the location of the plane within the body's anatomy and the type of movement which occurs in this plane. A high proportion of learners gained either one mark for identifying the 'transverse' plane or a mark for that twisting/rotation movement occurs in this plane.

7 Describe the plane of movement in which the spin shown in **Figure 3** occurs.

The plane of movement in which the spin occurs is the transverse plane. The transverse plane goes through the middle of the body, splitting it into two halves, top and bottom. The movement which occurs in the transverse plane is rotation which allows the body to spin.

This response gained 3 marks

One mark has been gained from identifying the transverse plane, with a further mark gained for describing the plane splits the body into top and bottom. This learner has then gained the final mark for linking the movement as rotation in the plane to allow the ice skater to spin.

7 Describe the plane of movement in which the spin shown in **Figure 3** occurs.

The plane of movement is the transverse plane. This is because all rotational movements happen in the transverse plane. Also it's not the sagittal plane because there is no flexion, extension or hyperextension involved. Also it's not the frontal because there is no adduction or abduction involved.

This response gained 2 marks

This response was the most common. The plane being identified and a linked description to the nature of movements being rotational.

7 Describe the plane of movement in which the spin shown in **Figure 3** occurs.

The movement that the ice skater is performing is rotation through the sagittal plane. The sagittal plane has consist of the appendicular skeleton which allows for these actions to be performed. The sagittal plane

This response gained 1 mark

A common error amongst learners who did not gain any marks was to identify the incorrect plane of movement. Often, like in this type of response the plane stated was sagittal. This learner still accessed a mark in this response for showing application of the movement being 'rotation'.

Q8

The command verb for this question is describe. Consequently, in order to gain marks learners are required to go beyond just identifying the key anatomical features used in the process of inspiration.

In order to gain full marks, learners should provide a logical description of the process that includes all key components detailing appropriate anatomical information and function for each.

The mark scheme should be viewed as an example answer.

This question was designed to be accessible but with sufficient scope to stretch and challenge learners. Whilst there were some excellent answers, overall the learner responses to this question were disappointing and reflected a poor 'full' application of inspiration.

8 Describe the mechanism of breathing during inspiration.

4 Q08

Inspiration describes the movement of air into the lungs, it is an active process as it involves both the contraction of the external intercostal muscles to move the ribcage up and out and upwards and the contraction of the diaphragm so that it flattens. Both of these processes allow for an increased volume of the thoracic cavity, and therefore a drop in ^{internal} pressure. As the ^{internal} pressure becomes lower than atmospheric pressure air is drawn into the lungs.

(Total for Question 8 = 4 marks) 4

This response gained 4 marks

This learner shows a response that is typical of a logical description. The descriptions are in a slightly different order but still credited as all anatomical information is accurate. The learner has correctly identified the external intercostal muscles with a description they contract to cause the ribs to move up and out. Similarly, the learner states contraction of the diaphragm causing it to flatten. The learner continues to show an understanding that the impact of the change in respiratory muscles brings about an increase in volume of the thoracic cavity. Very often, learners would write increase in 'size' of the 'chest' cavity. This is not credit worthy term. The final mark is awarded in this response, as the learner links the increase in thoracic volume to a drop-in pressure to be able to draw air in.

8 Describe the mechanism of breathing during inspiration.

1 Q08

Inspiration is started by the contraction of the diaphragm. This ~~is~~ combined with the intercostals contracting expands the lungs creating a pressure difference between the air inside the lungs and the air outside leading to the air rushing in through mouth or nasal cavity into the pharynx, larynx and then into the bronchi. The air then travels through to the end of the bronchioles where the alveoli are situated. Here gaseous exchange occurs.

This response gained 1 mark.

This response demonstrates an understanding of the inspiration process but lacks some key detail to access marks. The learner shows knowledge of 'contraction of the diaphragm'. To access the mark the knowledge would need to show what happens to the diaphragm in the inspiration process. Likewise, they echo understanding of the expansion of the ribs but mention contraction of the intercostal muscles. The detail required which intercostal muscles are used in inspiration, as external and internal have different roles depending on inspiration or expiration.

A mark is awarded in this response for the learner knowing the pressure difference between the air and lungs allows air to rush in. This is the final marking point and one that was most challenging but the mark a high proportion of learners were able to access. The last part of this learner response gains no credit but was typical of how some learners approach the question. They appeared to be confused with the respiratory anatomy part of the specification and would provide a logical description of a pathway of an oxygen molecule through the respiratory system which is not creditworthy for the process of inspiration.

8 Describe the mechanism of breathing during inspiration.

0 Q08

During inspiration, the ~~lungs~~ lungs expand. The ribcage must also expand to allow the lungs expansion. The intercostal muscles cause the expansion of the ribcage. The diaphragm relaxes during inspiration, which allows the lungs to fill the space while expanding.

This response gained 0 marks.

This learner did not gain any marks as they have not made any clear and detailed reference to the components associated with the process of inspiration as made clear in the comments above.

Q9

This question was designed to be accessible but with sufficient scope to stretch and challenge learners. There were some excellent answers and overall the learner responses to this question were pleasing and reflected a sound understanding of the function of the alveoli. A high proportion of learners were able to access 1 mark by stating the function as either gaseous exchange or diffusion.

9 Explain the function of alveoli.

4 Q09

The alveoli allow gaseous exchange to take place, they are tiny air sacs in the lungs of which there are millions. Each alveoli is surrounded by capillaries with blood running through them. The alveoli walls are very thin which allow ^{carbon dioxide} ~~oxygen~~ from the blood in the capillaries to diffuse into the air in the alveoli to be removed and oxygen to be diffused from the air into the blood to be used for energy production in the muscles and body. Because there are so many alveoli there is a large surface area so lots of diffusion is taking place.

(Total for Question 9 = 4 marks) **4**

This response gained 4 marks

One mark awarded here for identifying the function; gaseous exchange. A second mark is awarded for explaining alveoli are 'surrounded by capillaries'. It was common amongst learners to use a number of lines in the answer box to access the last marking point. This learner demonstrates an understanding of oxygen and carbon dioxide exchanging and locations are correct. In this instance, they show carbon dioxide coming from the blood to be removed and oxygen into the blood to be used. Large surface area was credited as an alternative to the second marking point in the mark scheme as it is an appropriate expansion of the how the alveoli carry out their function.

9 Explain the function of alveoli.

1 Q09

~~The~~ Alveoli are located at the end of the bronchioles as a part of the respiratory system. The process of gaseous exchange takes place in the alveoli. This is where oxygen is used ~~and~~ and carbon dioxide is processed. Your body does not need carbon dioxide but it needs oxygen. 21% of the air we breathe in is oxygen, 78% nitrogen and 0.04% carbon dioxide. Carbon dioxide is a poisonous gas but we are exposed to very little of it so we don't get affected. Diffusion also takes place in the alveoli. (Total for Question 9 = 4 marks) **1**

This response gained 1 mark.

This learner has identified that the process of gaseous exchange takes place in the alveoli. The learner recognised that oxygen and carbon dioxide are exchanged but does not expand to the locations as per the final marking point in the mark scheme. The detail on percentage of gases is not an expansion of explaining the overall function.

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.

The question asks learners to analyse how neural control of the heart regulates the cardiac cycle. Almost all of the learners attempted this question and were much more confident in describing the neural pathways of the electrical impulse through the heart. Learners identified the correct order of SA Node – AV Node – Bundle of His – Purkinje Fibres and for each were able to describe each stage. Those learners displayed a top of level 1 response – 3 marks, for showing isolated elements of knowledge, breaking the situation down into its components but making no or limited link with the cardiac cycle.

Those learners who additionally gave a link or clear relationship with how the impulse was working with elements of the cardiac cycle were able to access a level 2 mark, predominantly for four marks, depending on the quality of the response about the components of the cardiac cycle as per the indicative content.

In order for learners to access the higher end of level 2 and get into the level 3 grade descriptor, a more detailed and comprehensive description of the cardiac cycle was required. Learners could achieve this by including reference to systole and diastole taking place in the heart.

10 Analyse how the neural control of the heart regulates the cardiac cycle. 3 Q10
The cardiac cycle is the process of the heart contracting & relaxing & all that happens in one beat (SAN)
During the cardiac cycle, the sinoatrial node is the pacemaker of the heart. The sinoatrial node starts off by sending a signal to the atrium wall to contract and pump blood out into the ventricles. The atrioventricular node (AVN) then signals the ventricles to contract and pump blood out of the heart. The bundle of His transports this signal from the AVN and sends it to the Purkinje fibres which allow the ventricles to contract at a regular interval.
The autonomic nervous system controls firing of SAN to increase the heart rate which triggers the start of the cardiac cycle. The vagus nerve slows down heart rate by sending impulses through the SAN to decrease the power of ventricular contraction.
The sympathetic nervous system increases heart rate by increasing the power of ventricular contractions.

This response gained 3 marks

This response is very typical of a top of level 1 response seen in the series. It is clear in the first part of the question the learner has clear knowledge of the structures and functions of the neural pathway. This is isolated knowledge as per the level descriptor as there is limited linkage to the cardiac cycle. The learner does make reference to 'atria wall to contract to pump blood into the ventricles, but this is the only reference to the cycle and insufficient enough to access level 2. It is worth noting that the final paragraph of this response was typical of a high proportion of responses in that the learners would attempt to analyse the sympathetic nervous system and connection with

the medulla oblongata to increase the heart rate. This however does not answer the question which is specifically about the cardiac cycle

10 Analyse how the neural control of the heart regulates the cardiac cycle.

5 Q10

The heart must beat effectively to maintain the double pump system in the cardiac cycle is working. This is done through neural control. The brain is constantly ~~sending~~ monitoring the activity of the body using sensory neurons & sending signals for action with motor neurons. The brain uses the sinoatrial node (SAN) in the walls of the right atrium in the heart to tell the heart when to contract the atria. However the atria and the ventricles can't contract at the same time as the ventricles need to be relaxed and ready to receive blood from the atria. This is why the Atrioventricular node (AVN) is situated in the centre of the heart is there ~~to~~ ^{to} slow the signal from the SAN just a small fraction so that the ventricle fibres know exactly when to contract. Each muscle fibre in the heart has to be synced to achieve an efficient pump this is why Purkinje fibres & Bundle of His are there to carry that signal to each and every muscle fibre in the heart.

This response gained 5 marks

This is an example of a fairly typical level 2 response. The learner shows the similar knowledge of the neural control to the first exemplar response but the inter relationship with the cardiac cycle is clear. The learner has referenced the 'contraction of the atria', 'ventricles in a relaxed state so they can fill up with blood' and the 'slowing down of the impulse for the ventricles to contract'. There is inference to contraction (systole) and relaxation (diastole) but neither term is included in the response. This is however evident in the response below.

10 Analyse how the neural control of the heart regulates the cardiac cycle.

7 Q10

Neural control of the heart begins in the right atrium as the SA Atrial Node controls the systolic contraction of the atria by sending impulses to the heart's muscular walls. These impulses are slowed by the Atria ventricular Node which ensures the right ventricle is ready to fill with blood and isn't contracting at the same time as the atrium. This creates the natural rhythm of the heart's beat with the atria contracting as the ventricle and vice versa. The Bundle of His also regulates the cardiac cycle by receiving an impulse from the AV Node ~~and~~ for the ventricle to contract and sends the signal to Purkinje fibres. Purkinje fibres are located in the muscular septum which splits the heart into two sides. These fibres then contract for the ventricle's systole phase to pump blood out of the heart through the pulmonary artery towards the lungs where gaseous exchange occurs.

This response gained 7 marks

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, particularly in the knee. All movements occurred in the sagittal plane and again this added a level of accessibility for learners.

A number of learners found the trunk more challenging to analyse and had difficulty with all aspects of this joint, particularly the joint movement. This was surprising as the trunk has been included on

both of the sample assessment materials and on all the papers in the previous two series. Accurate analysis of the joint movement at the shoulder provided a greater level of challenge and these aspects enabled the question to differentiate between learners.

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. However few provided an 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 number of learners made reference to the muscular system detailing antagonistic muscle pairs and the types of contraction taking place in each. The question only asks about the skeletal system so no credit could be awarded for parts of the learner responses related to the muscular system. Part of the question so no credit could be awarded for responses with this.

11 Analyse how the axial and appendicular skeleton allows the movement necessary at the

- shoulder
- elbow
- trunk

for the athlete to move from the preparation phase to the execution phase.

(8)5 Q11

Joint	Type	Bone	Movement	Plane
Shoulder	B35	Clavicle Humerus Scapula	Extension	Sagittal
Elbow	Hinge	Radius Ulna Humerus	Flexion	Sagittal Transverse
Trunk	Gliding	vertebral column	Extension	Sagittal

For the athlete to reach the execution phase
~~the~~ a few adaption of the shoulder, ~~trunk~~ ^{trunk} and
Elbow need to take place.

At the shoulder the joint is a ball and socket
joint. To create the execution phase of movement
the shoulder joint undergoes extension.

The bones that are connect to the shoulder to
create this movement are ~~the~~ the clavicle, humerus
and scapula. The movement of the shoulder
takes place in the sagittal plane.

At the elbow the movement is slightly different
the elbow undergoes Flexion as the angle of the joint
is being shortened. This movement is taking place in
the transverse plane. The joint responsible of the
flexion of the elbow is a hinge, the hinge joint
in the elbow is connected to the radius, ulna
and the humerus and by these bones connecting
to muscle flexion takes place.

The ~~trunk~~ bones involved with the trunk is the
vertebral column. The bones in the column are
all gliding joints, the movement undergoing is
^{flexion} extension. The movement is taking place in the
sagittal plane to adapt the execution phase.

This response gained 5 marks

It is clear that this learner has planned out their response carefully. As a result, it addresses all of the key areas that would be expected in this type of analysis. The information provided is mostly accurate, although the plane at movement at the elbow and the joint movement at the trunk is incorrect. Full analysis of the shoulder is clear. The learner has also demonstrated analysis when moving to the execution phase which what is asked within the questions. Learners try to complete two sets of analysis; one for preparation phase and then again for execution phase.

11 Analyse how the axial and appendicular skeleton allows the movement necessary at the

- shoulder
- elbow
- trunk

for the athlete to move from the preparation phase to the execution phase.

(8) Q11

The shoulder is part of the appendicular skeleton, consisting of the clavicle and scapula bones which are both flat bones. The shoulder is a ball and socket joint which allows movement in every direction. In the preparation stage the shoulders are in the protraction position, but moving to execution they move to the retraction position.

The elbow is part of the axial skeleton which consists of the humerus, radius and ulna ^{bones} which are all long bones. The elbow is a hinge joint which only allows movement forwards and backwards. In the preparation stage the elbow is extending as it moves to the execution stage it is flexing.

The trunk is a part of the appendicular skeleton which is made up of the vertebrae, cervical, thoracic, lumbar, sacral and coccyx. The vertebrae is an irregular bone. The vertebrae is also a hinge joint, which allows movements only forwards and backwards. In the preparation stage your trunk is in a fixed position as well as going through into the execution stage. This means it is not moving as only your shoulder, arms and elbow is moving.

This response gained 3 marks

This learner has also tried to formulate a plan to structure their response. There are isolated elements of knowledge but there are a number of inaccuracies within the response and some key areas required for a detailed analysis of the movement. The points that have been accessed are generally those that may be considered more accessible.

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 hip, knee and ankle to achieve the position shown from preparation phase to execution phase.

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. However, the accuracy of their analysis has not always been sustained throughout the full range of joints and component parts included. As a result, attempts at consideration of interrelationships tended to be more limited.

A number of factors make this question more accessible to learners on this paper compared to the previous series. All movements are concentric contractions, in the sagittal plane and the hip and the knee both perform extension whilst the ankle performs plantarflexion. Yet learners frequently only achieved inclusion of some of this material. The joints in the question are also quite accessible to learners, particularly the knee.

Generally, learners accurately analysed the types of joints involved, the articulating bones and the joint movements. However, a number did not include the correct antagonistic muscle pairs, types of contraction or planes of movement and this is material that presents more challenge to learners.

The antagonistic muscle pairs at the knee and ankle are quite accessible, but those involved at the hip seemed to prove slightly more challenging to learners.

Likewise, to Q11, many learners also 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 create the 'volleyball dig' movement from preparation to execution and achieved marks at the lower end of the level 3 grade descriptor.

The nature of the whole movement invites better learners to expand and discuss the interrelationships between the different joints. There were a limited number of learners including synergists and fixator muscles. The kinetic chain of movement was also included by some learners, but this was mainly added as an isolated piece. The few learners who included this in their response were able to do so by showing context to the volleyball movement.

12 Analyse the required movement at the

- hip
- knee
- ankle

for the athlete to move from the preparation phase to the execution phase.

(14) 1212

All joints in this scenario are synovial meaning they are freely movable and range in planes of movement.

The hip consists of the pelvis and femur, it's a ball and socket joint. The preparation movement shows hip flexion due to the angle of the femur in ^{relation} to the body which is 90° instead of 180° . The iliopsoas/hip flexors contract while the gluteals relax. This is sagittal plane movement.

The knee, a hinge made of the tibia, fibula and femur is bent which shows flexion. Flexion is created by the hamstrings contracting concentrically and quadriceps relaxing, in this case there is weight on his legs which replicates a squat, in a squat the quadriceps eccentrically contract meaning they lengthen. This movement occurs on the sagittal plane.

The ankle, also a hinge consists of the tibia, fibula and tarsals. The movement present is plantar flexion as the shin seems to be leaning towards the metatarsals and corpus rather than being at 90° . Dorsiflexion requires the tibialis anterior to concentrically contract while the gastrocnemius relaxes. This is sagittal.

The execution phase requires muscular contractions to change the position.

The hip, a ball and socket made of the femur and ~~the~~ pelvis have now extended. Hip extension has occurred to reach the new position. The gluteals concentrically contract while the hip flexors relax. This is a sagittal plane.

The knee, a hinge made of the femur, tibia and fibula are now performing knee extension. Similar to kicking a ball, the quadriceps have to contract and shorten (concentric) while the hamstrings relax. This is how the player has straight legs, due to a sagittal plane movement.

The ankle, a hinge made of the tibia, fibula and talus are now pushing plantar flexion which is caused by a contracting gastrocnemius and a relaxing tibialis anterior. The contraction is concentric and occurs in the sagittal plane.

overall to get from preparation to execution. The hips extend, the knees extend and the ankle shows plantar flexion in order to complete the movement.

This response gained 12 marks

This is an example of a learner who has opted to analyse both phases separately. It is clear the knowledge from this learner is evident to just analyse the movement from preparation to execution as requested in the question stem. The learner demonstrates full analysis of each joint breaking down each component into equal parts and linking to the context of the movement. Therefore, it is at the lower end of the Level 3 grade descriptor. To access additional marks the learner would be required to show knowledge related to interrelationships with synergists, fixator muscles and/or the kinetic chain.

12 Analyse the required movement at the

- hip
- knee
- ankle

for the athlete to move from the preparation phase to the execution phase.

(14) 4 Q12

The hip is a ball and socket joint. The movement from the preparation stage to the execution phase ~~would~~ on the hip would be hip flexion. The bones that make up this joint is your pelvis and femur. The muscles that aid flexion would be your iliopsoas and gluteus maximus, the agonist would be your iliopsoas whereas the antagonist would be your gluteus maximus. The type of contraction occurring would be concentric so the muscle shortens.

The knee is a hinge joint. The movement from the preparation to the execution phase would be knee extension. The bones that make up this joint are femur, ~~tibia~~^{tibia} and fibula. The muscles that aid extension would be your hamstring and anterior tibia. The type of contraction whilst doing extension would be concentric as anterior tibia relaxes to allow contraction in the hamstring (shortening).

The ankle is a hinge joint. The bones that make up this joint is your tarsals. The movement occurring from the preparation to the execution phase would be plantar extension. The muscles that aid this movement would be your calf and soleus. The type of contraction occurring would be eccentric contraction.

This response gained 4 marks

This learner does not seem to have planned or executed a particular strategy to answer this question however has correctly focussed on the execution phase only. An attempt at key elements has occurred but are inaccurate in their analysis of this movement. For example, a full analysis is attempted at each joint, but the muscles identified incorrectly. In the case of the hip the muscles are identified correctly but not in the correct order as an antagonist pair. The plane of movement is also omitted. There are some isolated elements of knowledge and understanding that place this response at the lower end of the Level 2 marking descriptor.

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.
- 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 (eg 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 and space available as a guide to the depth of response required.
- Refer to the SAM and 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 focus on the movement from the preparatory phase to execution phase of the movement for analysis.

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