Examiners' Report/
Lead Examiner Feedback
Summer 2017

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, at Distinction, Merit, Pass and Near 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:
http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

**Unit 2: Functional Anatomy (31814H)**

| Grade | Unclassified | Level 3 | | | |
|---|---|---|---|---|---|
| | | N | P | M | D |
| **Boundary Mark** | **0** | **14** | **23** | **32** | **42** |

# Introduction

This is the first in the 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.

Centers' and learners should be acknowledged for their preparation for the substantial change to the assessment format. Overall, most learners were prepared and knowledgeable on various content from the specification for this assessment

The question paper followed the format identified in the sample assessment material. 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 10 to 20 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 interrelationship of the muscular and skeletal systems in movement analysis.

Questions 1 to 9 on the paper were assessed using 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, therefore marked using a 'levels based' approach to assessment were the overall quality of the response was considered rather than number of facts stated alone.

# Introduction to the Overall Performance of the Unit

Learner performance varied throughout the paper. The style of the assessment is challenging due to the depth and breadth of knowledge required to fully address the demands of the paper. The breadth of knowledge is tested across the questions, whilst depth of knowledge is particularly challenged in the extended responses required for question 10, 11 and 12.

Questions 1 to 9 have a higher demand of recall. However, the questions are structured to elicit different levels of response from learners, this is indicated through the number of marks available and the command verbs used in the question. For example, some recall questions ask learners to state or give, whilst other questions will ask for descriptions and explanations. This format of questioning allows for greater differentiation between learners, and examiners are better able to access the depth of learner knowledge and understanding.

Question 10 is designed to challenge the depth of knowledge of a specific key component of the specification in a sporting context; whilst question 11 further challenges the learner to apply functional anatomy specifically the appendicular skeleton to a movement analysis. Question 12 is particularly designed to stretch the learner with a focus on analysis of the interrelationship of the muscular and skeletal system to a specific sporting movement.

The learner is introduced to applying knowledge to a contextualised scenario in question 7 (which is smaller 'points based' marked) in order to help prepare the learner for the extended response questions. There are only a few instances within the paper where only recall of knowledge is required.

# 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 a very accessible question with the vast majority of learners achieving at least 1 mark for stating 1 correct function, with only some learners achieving two marks for correctly stating two functions of the cardiovascular system.

The most common two functions stated were

- Supply nutrients and oxygen
- Fight infection

**This response gained 2 marks**

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

1 State **two** functions of the cardiovascular system.

1 They provide nutrients and supply the body with oxygen.

2 They fight against infection.

Two marks gained for correctly stating two functions of the cardiovascular system

## This response gained 1 mark

1 State **two** functions of the cardiovascular system.

1 To supply oxygen and nutrients to the entire body.

2 To pump blood around the body.

1 mark gained for the correct response of 'to supply oxygen and nutrients'.

Popular incorrect responses generally focused functions of the heart such as 'pumping' blood around the body.  Two other common errors were to 'transport' blood around the body or 'maintain' blood flow.

**Q2(a)**

This question was answered well, learners should have achieved 1 mark, for giving the meaning of the anatomical terms 'distal'.

**This response gained 1 mark**

2   Give the meaning of the following anatomical terms:

(a) distal

(1)

*Furthest from , for example the hand is distal to the shoulder.*

One mark gained for correctly stating 'furthest from' combined with a correct reference point in the form of an appropriate example 'the hand is distal to the shoulder'. As the learner has already clarified distal is 'furthest from' 1 mark gained.

**This response gained 0 mark**

2   Give the meaning of the following anatomical terms:

(a) distal

(1)

*Taking the limbs away from the middle axis*

For the learners that scored 0 marks, a high proportion accurately stated 'situated away from' or 'furthest away', however it was the point of reference which was inaccurate and resulted in 0 marks being gained.

Popular incorrect responses generally focused on 'away from the midline of the body/axis'.  Midline of the body is not an accurate point of reference for the anatomical term 'distal'.

**Q2(b)**

This question was answered well. Learners should have achieved 1 mark for this question, for giving the meaning of the anatomical term 'Prone'. Most learners accurately gave the answer 'lying face down'.

**This response gained 1 mark**

(b) prone.

(1)

prone is when you are on your front and your back is toward the sky

One mark gained for correctly stating 'on your front' and clarifying the position by stating 'your back is towards the sky'.

**This response gained 0 mark**

(b) prone.

(1)

Prone means lying on your back face looking up.

0 marks gained as the answer given is incorrect.

On some occasions 'face down' was stated gaining 0 marks as there was no point of reference given. A point of reference is required to clarify the position, such as 'face down on chest, with back facing up'.

**Q3**

This question was answered well. The vast majority of learners achieving 1 mark for this question, for correctly identifying the function of a red blood cell. A smaller percentage of learners were able to gain a second mark for further appropriate expansion to fully explain the function of a red blood cell.

**This response gained two marks**

3    Explain the function of red blood cells.

> carry oxygen to living tissues and contain a protein called haemoglobin at which binds with oxygen to form oxyhaemoglobin. It has a concave Structure to maxmims capacity of oxygen carried.

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

1 mark gained for correctly stating the function of a red blood cell is to 'carry oxygen'. A further second mark was gained for the appropriate expansion correctly stating red blood cells contain hemoglobin which binds with oxygen.

**This response gained one mark**

3    Explain the function of red blood cells.

> Red blood cells carry oxygen in the blood and take them to the working muscles. They also carry carbon dioxide and takes them to be disposed of.

1 mark gained for the correct reference to 'carry oxygen', no further marks gained.

Most learners who gained one mark made reference to red blood cells carrying oxygen, but offered no further accurate information which could be accredited. Other incorrect responses gaining 0 marks made reference to fighting infection and disease.

**Q4**

This question asked learners to describe the systole phase of the cardiac cycle. As the command verb is 'describe' there was no need for learners to justify any part of their response, instead an account of the systole phase of the cardiac cycle. Generally, learners experienced difficulty with this question, possibly due to a lack of understanding of the cardiac cycle and the differentiation between systole and diastole.

The learners gained a maximum of 4 marks based on 4 linked points, which in combination, provided a logical description of the process of systole.

The majority of learners were able to identify 1 aspect or link 2 points, with a few higher end learners linking 3-4 accurate points.

This response gained 4 marks

4   Describe the systole phase of the cardiac cycle.

The systole phase of the cardiac cycle is when the heart contracts. This is when an impulse is sent from the SA node to AV node to the purkinje fibres and the bundle of his which also cause the ventricles to contract and push the blood out of the left atrium.

4 marks gained, 2 marks for reference to how the heart contracts during systole, 1 mark for 'ventricles contract' and a further mark for result of the ventricles contracting.

**This response gained 2 marks**

4   Describe the systole phase of the cardiac cycle.

The systole phase of the cardiac cycle is when the heart has contracted. This is when oxygenated blood will leave via the aorta to be transported to the working muscle. During this time, deoxygenated blood will also be ~~used~~ pumped back to the lungs via the pulmonary artery.

0 marks gained for 'heart contracts', specific reference needed to atria contract and ventricles contract to gain 2 marks. 1 mark was gained for the resultant factor of the contraction 'oxygenated blood will leave via the aorta to be transported to the working muscles' and a further 1 mark for 'deoxygenated blood pumped to the lungs via the pulmonary artery'.

0 marks gained for blank responses, incorrect information stated such as describing the flow blood and describing diastole instead of systole.

## Q5

Q5 assessed the learners' knowledge and understanding of how smooth muscle controls blood flow.

The smooth muscle which controls blood flow was poorly identified. Some learners were able to explain the control of blood flow via vasodilation and vasoconstriction.

Generally, learners experienced difficulty answering this question, possibly due to lack of terminology used as expected at level 3, knowledge of the specific unit content and misreading the question.

**This response gained 3 marks**

5    Explain how smooth muscle controls blood flow.

Smooth muscle Controls ρblood flow through the use of vaso dilation and vaso-Constriction. Those muscles that are working harder get hotter which causes the blood vessels to dilate increaseing blood flow to those parts, meanwhile vaso Constriction means those muscles that arent working as hard Constrict to reduce unessasary blood flow.(Total for Question 5 = 3 marks)

3 marks gained, 1 mark for identification of blood vessels, 2 further marks for making reference to and explaining vasodilation and vasoconstriction.

**This response gained 1 mark**

Smooth muscle contraction is involuntary.

**5** Explain how smooth muscle controls blood flow.

An example of smooth muscle is your iris. Blood Vessels are made up of smooth muscle. This is becau id can move smoothly through it and help transport the blood easily easily.

1 mark gained for the correct identification of smooth muscle found in blood vessels.

Many learners stated smooth muscle was found in structures such as the iris, digestive system and urinary tract. Whilst this is accurate information, this is not contained in the unit specification content and does not control blood flow. 0 marks gained.

Other common mistakes were stating vasodilation/vasoconstriction with no explanation provided of how blood flow is controlled, lack of use of terminology for level 3, and giving the wrong explanations for vasoconstriction/vasodilation (explanations the wrong way round).

## Q6

This question asked learners to describe the mechanism of expiration during exercise. The question was designed to be demanding, testing a higher order skill. It required learners to think about 'the mechanism' of expiration during exercise.

Generally, learners experienced difficulty with this question.

Learners appeared less able to describe the mechanism of expiration during exercise. Many learners responded by providing a description of exhalation, not applying their knowledge to the question, or misreading the question missing the word 'mechanism' asked for.

Learners were expected to provide 5 linked points, which in combination, provided a logical description of the mechanism of expiration.

**This response gained 2 marks**

**6**   Describe the mechanism of expiration during exercise.

The diaphragm and the intercostal muscles relax, which causes the ribcage to move down and downwards & inwards. The volume of the thoracic cavity decreases, causing the pressure in the thoracic cavity to increase. Air then rushes out of the lungs

2 marks gained, 1 mark for 'volume of thoracic cavity decreases' and 1 mark for 'pressure in the thoracic cavity increases causing air to rush out of the lungs'.

For a further 2 marks to be gained the learner would need to state

'The diaphragm relaxes and moves upwards or returns to original dome shape' and

'The internal intercostal muscles lower the rib cage'.

The learner does not explain what happens to the ribcage once relaxed, and makes no reference to INTERNAL intercostals.

An additional mark could be gained if the learner explained the role of abdominal muscles.

**This response gained 1 mark**

6  Describe the mechanism of expiration during exercise.

The diaphram relaxes and returns to its natural dome shape. The intercostal muscles relax allow air out of the mouth or nose. Expiration is where you are relesing the $CO_2$ from your body (breathing out)

1 mark gained for 'diaphragm relaxes and returns to natural dome shape.

Common mistakes made by the learner included stating the diaphragm moves upwards but not explaining how (by relaxing), diaphragm relaxes but not explaining what happens (moves upwards), refers to intercostals as opposed to internal intercostals or talked incorrectly about external intercostals.

**Q7**

The question was designed to be demanding, testing a higher order skill. Learners were given a spirometer trace of tidal volume during exercise, and were asked to explain how the neural control of breathing affects tidal volume. It required the learner to look at the spirometer trace, and identify that tidal volume increases during exercise. The learner would need to demonstrate their knowledge of tidal volume and explain how it would increase during exercise. The learners needed to think about 'neural control' as opposed to chemical control during exercise.

As an 'explain' question learners were expected to take one idea and expand on it. 1 mark was available for how tidal volume responds to exercise, with a further 3 marks for appropriate explanation.

Learners often gave correct responses for 1-2 marks, such as for 1 mark 'during exercise the volume of air breathed in and out with each breath increases'; and made appropriate reference to explain why for a further mark, for example 'this occurs as the need for oxygen increases/carbon dioxide levels rise'. A number of learners were able to explain the medulla oblongata was responsible for the neural response for 1 mark, a lesser number of learners were able to explain what the resultant factor was 'increasing stimulation to muscles in the respiratory system'.

Common incorrect responses include respiration rate increase, breath more times per minute, incorrect knowledge of tidal volume and reference to the brain as the neural centre as opposed to medulla oblongata.

**This response gained 3 out of 4 marks.**

7  Explain how the neural control of breathing affects tidal volume.

> Tidal Volume is the ~~amount~~ volume of air you take in on one breathe. This increases during exercise due to the muscles demand for an increase in oxygen, this is detected by the medulla oblongata and it is this which increases breathing rate.

1 mark for explaining tidal volume and increase during exercise.

1 mark for why 'increased demand for oxygen'.

1 mark for reference to medulla oblongata.

0 marks gained for reference to increase in breathing rate, as the learner does not explain how this happens.

**This response gained 1 mark out of 4.**

**Figure 1** shows a spirometer trace of tidal volume during exercise participation.

7   Explain how the neural control of breathing affects tidal volume.

*Chemoreceptors*
*$CO_2$*
*pH levels*

Because When the Chemireceptors detect a change in pH
test you exercise the level of $CO_2$ rises so the the
blood is more acidic but Chemoreceptors detect this change
in pH and try and nuetralise it the the tidal
volum would decrease again when exercising

1 mark for reference to CO2 rises.

When 0 marks were given, some learners tried to link tidal volume increase to neural control, but knowledge of tidal volume was insufficient, and neural control was too vague and made no specific reference to medulla oblongata, blank responses or explained inspiration and expiration.

**Q8**

As an 'explain' question learners were expected to identify two functions and explain each using an appropriate example.

The skeletal system functions of red blood cell production, supporting framework and movement were written into the stem, therefore discounting them as possible answers.

The question asked for the learner to explain, using examples, two other functions. Despite this some learners still referenced supporting framework and movement.

A high percentage of learners achieved 1 mark, with fewer achieving 2 marks as expected at pass level, some learners achieved 3 and only a few learners achieved all 4 marks.

Learners generally did not adequately explain using an example, protection of vital organs. Many learners just stated 'protection of vital organs, ie, the cranium protects the brain. This is not sufficient for an explanation at level 3.

**This response gained 4 marks**

8  Explain, using examples, **two other** functions of the skeletal system.

1 The skeletal system provides protection to vital areas and organs in the body, for example, the cranium protects the brain from impact as it is a very important muscle.

2 The skeletal system stores minerals such as calcium and phosphorus which our body needs and can be released during ossification.

The learner gained 4 marks. 1 mark each for identifying correctly the function of the skeleton, and 1 mark each for appropriate explanation using an appropriate example.

**This response gained 1 mark**

8   Explain, using examples, **two other** functions of the skeletal system.

1   ~~Movement~~ Bone growth as another function as the osteoclasts
    and osteoblasts in the end of the bone help it to
    grow also the epithial plate which helps growth in length

2   Protection of vital organs ~~as~~ is another function of the
    skeletal system as a vital organ such as the heart
    needs protecting by the rib cage.

1 mark gained for protection of vital organs. The example does not fully explain the function at level 3.

**Q9**

This question was designed to be an accessible question, and to stretch and challenge the learner to the next grade boundary.

As an 'explain' question learners were expected to explain two functions for two marks and provide further expansion for each for two additional marks.

A high percentage of learners achieved 2 marks, some learners achieved 3 marks and only a few learners achieved all 4 marks.

Learners generally explained the role of osteoclasts and osteoblasts well. The third mark generally was gained for further explanation of the osteoblasts and making reference to mineral deposits/calcium. Learners struggled to adequately explain the role osteoclasts to achieve all 4 marks.

**This response gained 3 marks**

9  Explain the role of osteoclasts and osteoblasts during bone remodelling.

During the process of bone remodelling, osteoclasts breakdown and clean away old bone. This then activates the osteoblasts which lay down collagen. The osteoblast then turn into osteocytes which form new bone cells and form the new bone.

1 mark each for the appropriate role of osteoclast and osteoblast, and 1 further mark for appropriate expansion of the role of osteoblast.

**This response gained 2 out of  marks.**

9  Explain the role of osteoclasts and osteoblasts during bone remodelling.

The role of oset osteoclasts during bone remodelling is that osteoclasts destroys the mature bone while osteoblasts form the new bone and replaces the mature bone that has been broken down.

1nmark each for role of osteoblast and osteoclast.

Where 0 marks were given, the role of osteoclasts and osteoblasts were the wrong way around, blank answers and lack of knowledge.

**Q10**

There was a good spread of marks for this question. There were some clear responses using appropriate technical language and terminology that scored nearer the higher range of marks available.

Responses to extended answer questions are marked using levels based mark schemes; the quality of the response determining the level. There are 4 levels; level 0 where there is no rewardable material presented and then levels 1, 2, 3; the higher the level the greater the quality of response.

For this question level 1 responses made some reference to muscle fiber types and either the intensity of contraction, speed of contraction or fatigability. Level 2 responses tended to demonstrate extended knowledge with reference to the question context of cycling and the changing demands of the race.

Only a very small number of learners were able to provide responses with accurate knowledge and understanding of neuromuscular control of muscle contraction to contribute to level 3.

Where learners did not gain marks, this was due to blank responses and deviating from what the question asked. A number of learners talked about aerobic and anaerobic respiration and energy production in relation to muscle fibre types. This is not included in unit 2 content and does not relate what the question asks.

Some leaners did not use the correct terminology as expected at level 3.

**This response gained 7 out 10 marks.**

Spencer is a cyclist.

He takes part in a long distance race.

He recruits different muscle fibre types to meet the changing demands of the race.

10 Analyse the neuromuscular control of muscle fibre type recruitment during Spencer's cycle race.

(10)

Spencer will only recruit muscle fibre type required at particular times within the race, this ensure none are wasted or fatigued to early on before required.

The main muscle fibre type recruited by Spencer during his cycle race will be Type 1. This is because he is cycling over a long distance and this fibre type will be most effective, as to being highly resistante to fatigue. It contains loads of mitochondria at which is released slowly over a long period of time.

When spece Spencer increases his speed or the intensity increases; for example cycling up a steep hill, type IIa will be recruited. This fibre type is more moderate at which contains some mitochondria and has a lower resistance to fatigue, but it provides

a stronger muscle contraction; which will help spencer accelerate up the hill. The muscle fibre type works both aerobic and anaerobically. Lastly when spencer is near to the finish line; for example, he will require maximal speed as then recruiting Type IIx. This muscle fibre type is poorly resistant to fatigue and little mitochondria, but provides the greatest muscle contraction.

For all cheses ~~theese~~ muscle fibres to be recruit, enough motor neuron need to be recruted otherwise no contraction at all will occur, this is known as 'All or none law'.

**This response gained 3 marks**

10 Analyse the <u>neuromuscular control</u> of <u>muscle fibre type recruitment</u> during Spencer's cycle race.

(10)

Spencer would be riding at different speeds throughout the race this might be because there might be a hill to go up to so there would also be using different fibre types throughout the race. Muscle fibres ~~might~~ are be broken down into 3 which are type 1, type 2a, type 2b/x.

type 1~~a~~ is ~~fast~~ slow twitch, low force, aerobic, used for long distances, ~~fatigue long~~ long to fatigue. & Spencer will be useng type 1 mostly throughout the race this would be when hes driving for long periods of time at a constant speed. That is when type 1 muscle fibres would be required.

Type 2a is medium twitch, more force than type 1, both aerobic and anerobic, used for distances such as 400 metres, faster to fatigue than type 1. Specer will be using this type when there is a smaller section

23

**Q11**

There was a good spread of marks for this question. There were some very clear responses using appropriate technical language and terminology that scored the higher range of marks available.

Responses to extended answer questions are marked using a levels based mark scheme. The quality of the response determining the level. There are 4 levels; level 0 where there is no rewardable material presented and then levels 1, 2, 3; the higher the level the greater the quality of response.

For this question level 1 responses demonstrated isolated elements of knowledge and understanding with regards to 'type of joint', 'bones', 'joint movement' and 'plane of movement for the hip, knee and ankle. No reference was made to the question context, information was presented in table format, or in generic statements. Inaccuracies may have been present.

Level 2 responses demonstrated knowledge of the appendicular skeleton and demonstrated in the main accurate knowledge and understanding, in relation to the question context, but often failed to contextualize fully movement analysis.

Level 3 responses demonstrated accurate knowledge, provided sustained coverage of relevant information in relation to the question context with a fully comprehensive contexualisation.

Where learners did not gain marks, this was due to blank responses and deviating from what the question asked. A number of learners talked with reference to the muscular system such as agonist and antagonist muscles. This is not what is asked in the question, nor in reflected in the SAM.

Some leaners did not use the correct terminology expected at level 3.

**This response gained 7 out of 10 marks**

11 Analyse how the appendicular skeleton allows the range of movement necessary at the:

- hip
- knee
- ankle

to move from standing to the squat position.

(10)

The appendicular skeleten ~~consiste~~ consists of the shoulder grindle and hip grindle along with upper and lower body limbs.

The hip is a ball and socket Joint which can move in almost every direction. In figure two, to achieve the squat position the movement type occuring here is hip flexion. The articulating bones of the hip are the femur, pelvis, illium, ishium. The plane of which this movement happens through is the sagital plane.

The knee is a hinge Joint and can perform

The ankle is also a hinge Joint. The movement type happening to achieve the squat position is plantarflexion. The articulating bones are the fibula, tibia and tarsals. The plane of which this movement happens through is the sagittal plane also.

flexion and extension. To achieve the position (squat) ~~Shenp,~~ flexion is occuring. ~~Bae Presesas saaiea~~ The articulating bones are the ~~postellex,~~ femur, fibula and tibia. The plane of which the movement happens through is again the sagittal plane.

Level 3 achieving 7 marks provided accurate knowledge, providing sustained coverage of relevant information in relation to the question context with a fully comprehensive contextualisation.

**This response gained 1 mark**

| Joint | Agonist | Antagonist | Synergist | Fixator | Joint movement (10) |
|---|---|---|---|---|---|
| Hip | ~~Quadricep~~ Tensor Fisciae | Gluteus maximus | Quadricep | Hastring | Flexion |
| Knee | Quadricep | Hamstring | Gluteus ~~maximus~~ maximus | Hip flexors | Flexion |
| Ankle | Gastrochemius Tibialis (switch) | Soleus | Hamstrings | Dorsiflexion |

Level 1, 1 mark gained for isolated element of knowledge and understanding shown.

Centres must access SAM and additional SAM material to support learner exam preparation. Centres should scrutinise the mark scheme to understand the level of knowledge and understanding required.

Learners are expected to provide answers in line with the information in the tables for the movement shown. Interrelationships are expected to be provided, with full written analysis of how the skeletal system works to perform the movement. Additional information demonstrating knowledge of the skeletal system can be provided such as range of movement permitted at the synovial joints due to shape of articulating bones and associated ligaments. Marks will be gained in relation to the detail and depth of coverage the movement.

**Q12**

This question was be one of the most demanding questions on the paper. The question asked 'analyse the required movement of the trunk, left knee and left ankle to achieve the position shown from preparation phase to execution phase'.

There was a good spread of marks for this question, although only a small percentage of learners achieved the higher end of marks.

There were some very clear responses using appropriate technical language and terminology that scored nearer the higher range of marks available.

Responses to extended answer questions are marked using levels based mark schemes; the quality of the response determining the level.  There are 5 levels; level 0 where there is no rewardable material presented and then levels 1, 2, 3, 4; the higher the level the greater the quality of response.

For this question level 1 responses demonstrated isolated elements of knowledge and understanding with regards to  'type of joint', 'bones', 'planes of movement', 'joint movement', agonist and antagonist muscles and muscle contraction.   For the lower end marks no reference was made to the question context, information was presented in table format or in generic statements. Inaccuracies may have been present.

Level 2 responses provided in the main accurate knowledge and understanding, in relation to the question context, but often failed to contextualize fully movement analysis.

Level 3 responses demonstrated accurate knowledge, provided sustained coverage of relevant information in relation to the question context with a fully comprehensive contextualization.

Level 4 responses demonstrated the ability to integrate and synthesis relevant information in relation to the movement analysis.  Contextualized analysis was well developed with thorough understanding of linkages and relationships.

Where learners did not gain marks, this was due to blank responses and lack of knowledge and understanding.

Some learners did not use the correct terminology expected at level 3.

Popular incorrect responses included getting the agonist and antagonist muscles of a specific joint movement the wrong way around.  Other incorrect responses included incorrect muscle contractions and planes of movement.

Learners are expected to discuss elements of movement analysis related to the kinetic chain and the interrelationship between the anatomical systems. Some learners did attempt to write about movement efficiency but often these were limited and demonstrated a lack of full understanding in this area of the specification.

**This response gained 15 out of 20 marks**

12 Analyse the required movement of the trunk, left knee and left ankle to achieve the position shown from preparation phase to execution phase.

(20)

| Joint | Type of joint | Joint movement | Bone | Muscle | antaginst pair | Contraction | Plane of movement |
|---|---|---|---|---|---|---|---|
| Trunk | | flexion | pelvic vertebral column | abdominals latissimus dorsi | agonist - abdominals antagonist latissimus | Isotonic Concentric | Sagittal Sagittal |
| left knee | hinge | Extension | femur Tibia/patella | hamstring quadricep | agonist quadricep antagonist hamstring | Concentric | Sagittal |
| left ankle | Gliding | Plantflexion | tarsal Tibia navicular | Gastronemis Tibia | agonist gastnemius antagonist tibia | concentric | Sagittal |

Flexion occurs at the trunk to allow the position to be achieved from the preparation phase to execution phase. The bones involved are the vertibral column and pelvic. The antaganistic pairs that allow the movement are to the abdominals/obliques; which are the agonist as for the antagonist being the latissimus dorsi. This type of contraction was concentric occurring on the sagittal plane.

Extension occurs at the left knee to achieve the shown position from the preparation phase to execution phase. This extension occurs at the hinge joint of the left knee. The articulating bones are the femur and ~~Tibia~~ Tibia. Whereby the antagonistic pairs

are the quadricep being the agonist and the hamstring being the antagonist. This type of contration is concentric occuring on the Saggital plane. Allowing the hurdler to trafer his weight to get over the hurdle.

lastly, planterflexion occurs at the gliding join of the left ankle, whereby the articulating bones are the tibia and metatarsal of the tarsal bone. The gastrocnemsus is the agonist muscle and the tibia antonis is the antagonist. The type of muscle contraction is also concentric at which occurs on the Sagittal plane. Planterflexion of the ankle allows the hurder the to lead his body weight more over towards the other side of the hurder and making it less likely for his to knock the hurdle down.

Level 3 15 marks. The learner should demonstrate accurate knowledge, provide sustained coverage of relevant information in relation to the question context with a fully comprehensive contextualization.

**This response gained 2 marks**

12 Analyse the required movement of the trunk, left knee and left ankle to achieve the position shown from preparation phase to execution phase.

(20)

| | Agonist | Antagonist | Synergist | Fixator | Joint action | Muscle contraction | Joint type |
|---|---|---|---|---|---|---|---|
| trunk | Abdominals | latissimus dorsi | external obliques | bicep brachii | Flexion | Isometric | ball and socket |
| Left knee | hamstring | Quadriceps | Gluteus maximus | Abdominals | extension | eccentric | hinge |
| left ankle | Gastroc-nemius | tibialis anterior | | | extension | eccentric | condeloid |

The trunk wouldn't have to do much except stabilise the body in this position so he can jump over the hurdle. In the preparation phase the abdominals and biceps would have co-

ntracted to assist the Jump of the hurdler, then in the execution phase, if those muscles would have relaxed as all the work was then passed on the to the legs. In the preparation phase, the left knee would have been assisted by the Quadricep and Gastrochemius to lift off and gain power for the jumps, and then in the execution phase, the leg extends and the hamstring contracts,

all the power has been used and now the hurdler is stretching his muscle so he can jump over the hurdle. The left ankle in the preparation phase would have dorsiflexion and so the ~~foot~~ muscle below the Gastrocnemius would have been stretched then in the execution phase the ankle stretches the other way, plantarflexion and the Gastrocnemius is contracted helping the hurdler's landing when he gets over the hurdle

Band 1, 2 marks for evidence of isolated knowledge and understanding,

Centres must access SAM and additional SAM material to support learner exam preparation. Centres should scrutinise the mark scheme to understand the level of knowledge and understanding required.

Learners are expected to provide answers in line with the information in the table, for stated phase of the movement.

Interrelationships in the phase are expected to be provided, with full written analysis of how the skeletal and muscular system are working together to perform the movement. Additional information demonstrating knowledge of the skeletal and muscular system can be provided, to show a deeper understanding of the interrelationship between the two systems.

Marks will be gained in relation to the detail and depth of coverage of movement.

# Summary

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

- Read all questions carefully to ensure the learner fully understands what is being asked
- Understand terminology used in the specification as these words will be repeated in the exam paper
- Use appropriate technical language throughout your response ie, vasodilate as opposed to get bigger
- Use the number of marks gained and the space available as a guide to the depth of the response
- Identify key words in a question – possibly underline to draw attention to them
- Make sure you apply your answers to the correct context, as given in the question
- Refer to the SAM and additional SAM material learner work for question 11 and 12, to familiarise self with the expected response, and to complete exam preparation.
- Please click here for the specification and SAMS

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