

# Mark Scheme

## Additional Sample Assessment Material

Pearson BTEC Level 3 – Sport and  
Exercise Science

Unit 2: Functional Anatomy (31814)

## **BTEC Qualifications**

BTEC qualifications come from Pearson, the world's leading learning company. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.btec.co.uk](http://www.btec.co.uk) for our BTEC qualifications.

## **Pearson: helping people progress, everywhere**

Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk)

Sample Assessment Materials

Publications Code xxxxxxxx\*

All the material in this publication is copyright

© Pearson Education Ltd 2017

# Unit 2: Functional Anatomy

---

## General marking guidance

- All learners must receive the same treatment. Examiners must mark the first learner in exactly the same way as they mark the last.
- Marking grids should be applied positively. Learners must be rewarded for what they have shown they can do, rather than be penalised for omissions.
- Examiners should mark according to the marking grid, not according to their perception of where the grade boundaries may lie.
- All marks on the marking grid should be used appropriately.
- All the marks on the marking grid are designed to be awarded. Examiners should always award full marks if deserved. Examiners should also be prepared to award zero marks, if the learner's response is not rewardable according to the marking grid.
- Where judgement is required, a marking grid will provide the principles by which marks will be awarded.
- When examiners are in doubt regarding the application of the marking grid to a learner's response, a senior examiner should be consulted.

## Specific marking guidance

---

The marking grids have been designed to assess learner work holistically. Rows in the grids identify the assessment focus/outcome being targeted. When using a marking grid, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner's response and place it within that band. Learners will be placed in the band that best describes their answer.
- The mark awarded within the band will be decided based on the quality of the answer, in response to the assessment focus/outcome and will be modified according to how securely all bullet points are displayed at that band.
- Marks will be awarded towards the top or bottom of that band, depending on how they have evidenced each of the descriptor bullet points.

Question Number	Answer	Mark
1	<p>Award <b>two</b> marks for any <b>two</b> of the following:</p> <ul style="list-style-type: none"> <li>• Supporting framework</li> <li>• Protection</li> <li>• Attachment for skeletal muscle</li> <li>• Source of blood cell production</li> <li>• Store of minerals</li> <li>• Movement</li> </ul> <p><b>Accept any other appropriate responses</b></p>	2

Question Number	Answer	Mark
2a	<p>Award <b>one</b> mark for any <b>one</b> of the following:</p> <ul style="list-style-type: none"> <li>• Body part furthest from the middle or centre of the body</li> <li>• The side of the body</li> <li>• Away from the midline of the body</li> </ul> <p><b>Accept any other appropriate responses</b></p>	1
2b	<p>Award 1 mark for any <b>one</b> of the following:</p> <ul style="list-style-type: none"> <li>• Lying with the face up</li> <li>• Lying on the back</li> </ul> <p><b>Accept any other appropriate responses</b></p>	1

Question Number	Answer	Mark
3 a	<p>Award <b>one</b> mark for the function and <b>one</b> mark for the identification of the location:</p> <p>During systole the ventricle contracts closing the bicuspid valve (1) and prevents the backflow of oxygenated blood in to the left atrium (1)</p> <p>Do not accept just 'backflow of blood'.</p> <p><b>Accept any other appropriate responses</b></p>	2
3b	<p>Award <b>one</b> mark for the location and one mark for the function.</p> <p>The sino atrial node is located in the right atria (1) and is the pace maker for the cardiac cycle (1).</p> <p><b>Accept any other appropriate responses</b></p>	2

Question Number	Answer	Mark
4a	Award one mark for each role described.  The nasal cavity warms the air when it is breathed in. (1) The nasal cavity filters the air that is breathed in (1) .	2
4b	Answers should contain <b>four</b> linked points, which in combination, provides a logical description of the mechanism of inspiration.  The diaphragm contracts and moves downwards (1) the external intercostal muscles contract and raise the rib cage (1) increasing the volume of the thoracic cavity (1) decreasing the pressure in the lungs so air forced into the lungs (1)  <b>Accept any other appropriate responses</b>	4

Question Number	Answer	Mark
5	Award <b>one</b> mark for stating the role of a ligament.  <ul style="list-style-type: none"> <li>• Stabilises a joint</li> <li>• Restricts joint movement</li> </ul> <b>Accept any other appropriate responses</b>	1

Question Number	Answer	Mark
6	Award <b>one</b> mark for the identification of the type of muscle contraction at the quadriceps during the downward phase of the squat and a further <b>two</b> marks for appropriate expansion.  Eccentric contraction (1) where the muscle (quadriceps) lengthens as it contracts (1) In order to control (the speed of) the downwards movement (1)  <b>Accept any other appropriate responses</b>	3

Question Number	Answer	Mark
7	<p>Award up to <b>one</b> mark for identifying mechanism which controls breathing, and a further <b>three</b> marks for an explanation</p> <p>Chemical control (1) due to increase in production of carbon dioxide which is detected by chemoreceptors (1) which respond to changes in pH in the blood due to dissolved carbon dioxide (1) turning into carbonic acid/providing an increase in hydrogen ions (1)</p> <p><b>Accept any other appropriate responses</b></p>	4

Question Number	Answer	Mark
8	<p>Award up to <b>one</b> mark for identifying a function and a further <b>three</b> marks for explanations related to this function.</p> <p>Control of blood flow (1) through vasoconstriction and vasodilation (1) vasoconstriction is reducing blood flow and vasodilation increasing blood flow (1) this is permitted due to the thicker muscular wall in the arteries and arterioles which control the size of the lumen (1)</p> <p><b>Accept any other appropriate responses</b></p>	4

Question Number	Answer	Mark
9	<p>Award <b>one</b> mark each analytical point</p> <p>The lymphatic system is part of the body's immune system and interacts with the blood to form lymph fluid (1). Blood and lymphatic vessels carry white blood cells which collect in the lymph node (1) the lymph node uses white blood cells to defend the body in removing bacteria (1) and the bacteria-free, filtered fluid is returned to the blood reducing infection (1)</p> <p><b>Accept any other appropriate responses</b></p>	4

Question Number	Answer	Mark
10	<p>Answers will be credited according to the learner's demonstration of knowledge and understanding of the material, using the indicative content and level of descriptors below. The indicative content that follows is not prescriptive. Answers may cover some/all of the indicative content but learners should be rewarded for other relevant answers.</p> <p><b>Bone Growth</b></p> <ul style="list-style-type: none"> <li>• A long bone, such as the femur, grows in length at either end in regions called growth plates. Growth plates are found in the epiphysis which are the ends of a long bone.</li> <li>• Growth occurs when cartilage cells divide and increase in number in these growth plates. The cartilage cells push older, larger cartilage cells towards the middle of the bone.</li> <li>• Eventually the older cells die and the space they occupied is replaced with bone. When the bone has reached its full size, the growth plates are converted into bone.</li> <li>• Bone remodelling is a lifelong process by where mature bone tissue is removed through a process called bone resorption, and new bone tissue is formed through ossification.</li> <li>• It is the osteoclasts that break down bone, and are responsible for the resorption phase.</li> <li>• Osteoblasts are cells that form new bone, and control calcium and mineral deposition.</li> <li>• Vitamin D is important in bone metabolism, and for optimal functioning of osteoblasts and osteoclasts.</li> <li>• The osteocyte cells are capable of bone deposition and resorption. During bone remodelling they transmit signals to other osteocytes in response to even slight deformations of bone.</li> </ul>	8

	<ul style="list-style-type: none"> <li>• Bone remodelling is more effective when additional stresses are placed upon it.</li> <li>• Osteocytes can also aid in calcium removal from the bone when the body's calcium level drops too low.</li> </ul>	
--	--	--

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question.</li> <li>• Limited analysis which contains generic assertions rather than interrelationships or linkages.</li> </ul>
Level 2	4-6	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.</li> <li>• Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</li> </ul>
Level 3	7-8	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.</li> <li>• Displays a developed and logical analysis which clearly considers some interrelationships or linkages in a sustained manner.</li> </ul>

Question Number	Answer	Mark															
11	<p>Learners are expected to provide answers in line with the information in the tables for the movement shown.</p> <p>Interrelationships 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 interrelationships between the two systems.</p> <p>Marks will be awarded in relation to the detail and depth of coverage the movement.</p> <p>Range of movement permitted at the synovial joints due to shape of articulating bones and associated ligaments, can also be explored.</p> <table border="1" data-bbox="316 779 1281 976"> <thead> <tr> <th>Joint/area of body</th> <th>Type of joint</th> <th>Bones</th> <th>Joint movement</th> <th>Plane of movement</th> </tr> </thead> <tbody> <tr> <td>Shoulder</td> <td>Ball and socket</td> <td>Scapula humerus</td> <td>Extension</td> <td>Sagittal</td> </tr> <tr> <td>Elbow</td> <td>Hinge</td> <td>Humerus Ulna</td> <td>Flexion</td> <td>Sagittal</td> </tr> </tbody> </table> <p><b>Additional factors responsible for movement</b> Joint shape determines range of motion, due to shape of articulating surfaces and arrangement of other structures supporting the joint e.g. ligaments.</p> <p><b>Shoulder</b></p> <ul style="list-style-type: none"> <li>• Ball and socket joint</li> <li>• The joint is formed by the articulation of the scapula and humerus</li> <li>• Although a great range of movement is possible at the shoulder due to the shape made by the articulating bones, to achieve the sprint position shown, the movement is an extension of the shoulder, as the arm has moved behind the anatomical position.</li> </ul> <p><b>Elbow</b></p> <ul style="list-style-type: none"> <li>• Hinge</li> <li>• The joint is formed by the articulation of the ulna and humerus</li> <li>• As the Elbow is a Hinge joint, joint movement is possible in only one plane that of the sagittal plane.</li> <li>• In the picture, we can see the athletes Elbow shows an element of flexion in order to allow a bend in the arm.</li> </ul>	Joint/area of body	Type of joint	Bones	Joint movement	Plane of movement	Shoulder	Ball and socket	Scapula humerus	Extension	Sagittal	Elbow	Hinge	Humerus Ulna	Flexion	Sagittal	8
Joint/area of body	Type of joint	Bones	Joint movement	Plane of movement													
Shoulder	Ball and socket	Scapula humerus	Extension	Sagittal													
Elbow	Hinge	Humerus Ulna	Flexion	Sagittal													

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
	0	No rewardable material.
Level 1	1-3	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question.</li> <li>• Limited analysis which contains generic assertions rather than interrelationships or linkages.</li> </ul>
Level 2	4-6	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.</li> <li>• Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</li> </ul>
Level 3	7-8	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.</li> <li>• Displays a developed and logical analysis which clearly considers some interrelationships or linkages in a sustained manner.</li> </ul>

Question Number	Answer	Mark																												
12	<p>Learners are expected to provide answers in line with the information in the table, for stated phase of the movement.</p> <p>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.</p> <p>Marks will be awarded in relation to the detail and depth of coverage of movement.</p> <p>At A – preparation to follow through stage</p> <table border="1" data-bbox="284 640 1410 1200"> <thead> <tr> <th>Joint</th> <th>Type of joint</th> <th>Bones</th> <th>Plan of movement</th> <th>Joint movement</th> <th>Muscles</th> <th>Muscle contraction</th> </tr> </thead> <tbody> <tr> <td>Ankle</td> <td>Hinge</td> <td>Tibia Tarsals</td> <td>Sagittal</td> <td>Plantarflexion</td> <td>Agonist – gastrocnemius  Antagonist – tibialis anterior</td> <td>Concentric</td> </tr> <tr> <td>Elbow</td> <td>Hinge</td> <td>Humerous Ulna</td> <td>Sagittal</td> <td>Extension</td> <td>Agonist – triceps  Antagonist – biceps</td> <td>Concentric</td> </tr> <tr> <td>Wrist</td> <td>Condylloid</td> <td>Radius Fibula Carpals</td> <td>Sagittal</td> <td>Flexion</td> <td>Agonist – wrist flexors  Antagonist – wrist extensors</td> <td>Concentric</td> </tr> </tbody> </table> <p>All three joints are synovial joints, allowing a specific a specific range of movement. The muscles that work across each joint are connected to the bone via tendons. The bones of each joint are held together securely by ligaments, to provide stability at the joint.</p> <p><b>Ankle</b></p> <ul style="list-style-type: none"> <li>• Hinge joint.</li> <li>• The joint is formed by the articulation of the tibia and tarsals.</li> <li>• As the ankle is a hinge joint, movement is only possible in one plane, the sagittal plane.</li> <li>• In the picture we can see the ankle is plantarflexed.</li> <li>• The muscles that bring about plantarflexion at the ankle is the gastrocnemius. The gastrocnemius is the agonist muscle. In order for the gastrocnemius to contract, the antagonist, in this case the tibialis anterior, must relax.</li> <li>• As the gastrocnemius contract, they shorten, pulling on the bone attached to the muscles insertion point, allowing the movement at the ankle.</li> <li>• As there is movement at the ankle in this phase, the type of muscle contraction is concentric.</li> </ul>	Joint	Type of joint	Bones	Plan of movement	Joint movement	Muscles	Muscle contraction	Ankle	Hinge	Tibia Tarsals	Sagittal	Plantarflexion	Agonist – gastrocnemius  Antagonist – tibialis anterior	Concentric	Elbow	Hinge	Humerous Ulna	Sagittal	Extension	Agonist – triceps  Antagonist – biceps	Concentric	Wrist	Condylloid	Radius Fibula Carpals	Sagittal	Flexion	Agonist – wrist flexors  Antagonist – wrist extensors	Concentric	14
Joint	Type of joint	Bones	Plan of movement	Joint movement	Muscles	Muscle contraction																								
Ankle	Hinge	Tibia Tarsals	Sagittal	Plantarflexion	Agonist – gastrocnemius  Antagonist – tibialis anterior	Concentric																								
Elbow	Hinge	Humerous Ulna	Sagittal	Extension	Agonist – triceps  Antagonist – biceps	Concentric																								
Wrist	Condylloid	Radius Fibula Carpals	Sagittal	Flexion	Agonist – wrist flexors  Antagonist – wrist extensors	Concentric																								

**Elbow**

- Hinge joint
- The joint formed by the articulation of the humerus and ulna
- As the elbow is a hinge joint, movement is only possible in one plane, the sagittal plane.
- Flexion and extension occurs in the sagittal plane. In the picture, we can see the thrower extends at the elbow joint, in order to stretch the arm as far forward as possible to propel the ball forward.
- The muscles that bring about extension at the elbow are the triceps. The triceps are the agonist muscle. In order for the triceps to contract, the antagonist, in this case the biceps, must relax.
- As the triceps contract, they shorten, pulling on the bone attached to the muscle insertion point, in this case the ulna, allowing the elbow to straighten.
- As there is movement at the elbow, in this phase the triceps are contracting concentrically.

**Wrist**

- Condylloid joint.
- The joint is formed by the articulation of the radius, ulna and carpal bones
- As the wrist is a condylloid joint, movement is possible in more than one plane, however, in this case it is the sagittal plane.
- In the picture we can see the wrist is in Flexion.
- The muscles that bring about flexion at the wrist are the wrist flexors. The wrist flexors are the agonist muscles. In order for the wrist flexors to contract, the antagonist, in this case the wrist extensors, must relax.
- As the wrist flexors contract, they shorten, pulling on the bone attached to the muscles insertion point, allowing the movement at the wrist.
- As there is movement at the wrist, in this phase, the type of muscle contraction is concentric.

<b>Level</b>	<b>Mark</b>	<b>Descriptor</b>
	0	No rewardable material.
Level 1	1-5	<ul style="list-style-type: none"> <li>• Demonstrates isolated elements of knowledge and understanding.</li> <li>• Breaks the situation down into component parts and a few of the points made will be relevant to the context in the question.</li> <li>• Limited analysis which contains generic assertions rather than interrelationships or linkages.</li> </ul>
Level 2	6-10	<ul style="list-style-type: none"> <li>• Demonstrates some accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and some of the points made will be relevant to the context in the question.</li> <li>• Displays a partially developed analysis which considers some interrelationships or linkages but not always sustained.</li> </ul>
Level 3	11-14	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Breaks the situation down into component parts and most of the points made will be relevant to the context in the question.</li> <li>• Displays a developed and logical analysis which clearly considers some interrelationships or linkages in a sustained manner.</li> </ul>

Pearson Education Limited. Registered company number 872828  
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE

Ofqual  




Llywodraeth Cynulliad Cymru  
Welsh Assembly Government

