



Mark Scheme - Final

June 2018

Pearson BTEC Level 3 – Sport and  
Exercise Science

Unit 2: Functional Anatomy

## **BTEC Qualifications from Pearson**

BTEC qualifications 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)

June 2018

Publications Code 31814H 1806\_MS

All the material in this publication is copyright

© Pearson Education Ltd 2018

## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- All marks on the mark scheme should be used appropriately.
- All marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if a candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt about applying the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed-out work should be marked UNLESS the candidate has replaced it with an alternative response.
- Phonetic spelling should be accepted.

### **Specific marking guidance for levels-based mark schemes\***

Levels-based mark schemes (LBMS) have been designed to assess the learner's work holistically. They consist of two parts: indicative content and level-based descriptors. Indicative content reflects specific content-related points that a learner might make. Levels-based descriptors articulate the skills that a learner is likely to demonstrate in relation to the assessment outcomes being targeted by the question. Different rows in the levels represent the progression of these skills. When using a levels-based mark scheme, the 'best fit' approach should be used.

- Examiners should first make a holistic judgement on which band most closely matches the learner 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/objective 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.

## BTEC Next Generation Mark Scheme Template

### Functional Anatomy Unit 2 – Series 1806 – Final

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 1               | <p>Award <b>one</b> mark for the identification of a function, and <b>one</b> further mark for linked descriptive point.</p> <ul style="list-style-type: none"> <li>To prevent bone damage/wear and tear/friction between bones (1) by providing a smooth lubricated surface / absorbing impact (1)</li> </ul> <p>Accept any other answers as appropriate.</p> | 2    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 2a              | <p>Award <b>one</b> mark for stating the meaning of the anatomical term supine.</p> <ul style="list-style-type: none"> <li>Face upwards</li> <li>Lying on your back looking upwards</li> <li>Palm facing upwards</li> </ul> <p>Accept any other appropriate response.</p>                                    | 1    |
| 2b              | <p>Award <b>one</b> mark for stating the meaning of the anatomical term proximal.</p> <ul style="list-style-type: none"> <li>Closer to its origin/point of attachment</li> <li>Closer to the centre/midline of the body</li> <li>Towards the centre</li> </ul> <p>Accept any other appropriate response.</p> | 1    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 3               | <p>Award <b>one</b> mark for the function and <b>one</b> further mark for linked descriptive point.</p> <p>The tricuspid valve prevents the backflow of blood (1) by closing when the ventricle contracts (1)</p> <p>The tricuspid valve opens when the atrium contracts (1) and allows the flow of blood into the ventricle (1)</p> <p>The function of the valve is to prevent back flow of blood (1) from the right ventricle into the right atrium (1)</p> <p>Accept any other appropriate responses.</p> | 2    |

| Question Number | Answer  | Mark |
|-----------------|---|------|
| 4               | <p>Award <b>one</b> mark for the identification of fibrous/fixed joints, award <b>one</b> mark for a relevant example, and up to <b>two</b> marks for linked descriptive point.</p> <p>Fibrous/Fixed joints (1) for example in the cranium (1) and do not permit movement/is made from connective tissue (1) and provides protection to the brain (1)</p> <p>Fibrous/Fixed joints (1) for example in the pelvis(1) and do not permit movement (1) and provides protection to the reproductive organs (1)</p> <p>Accept any other appropriate answers.</p> | 4    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 5               | <p>Award <b>one</b> mark for identifying isometric contraction and one mark for each explanatory point.</p> <p>Isometric contraction (1) as this type of contraction occurs when a muscle develops tension (1) but there is no change in its length to the muscle (1)</p> <p>Accept any other appropriate answers.</p> | 3    |

| Question Number | Answer  | Mark |
|-----------------|---|------|
| 6a              | <p>Award <b>one</b> mark for each correct identification of bone anatomy, up to a maximum of <b>three</b> marks.</p> <p>B - Cancellous bone<br/>E - Periosteum<br/>C - Growth plate</p> | 3    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 6b              | <p>Award <b>one</b> mark for identification of the function of a growth plate and up to <b>two</b> marks for each linked descriptive point.</p> <p>The growth plate is the site where bones increase in length (1)and then ossification occurs to harden the bone /create new bone (1) and prevent further growth at maturity (1)</p> <p>Accept any other appropriate answers.</p> | 3    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 7               | <p>Award <b>one</b> mark for identification of the plane of movement and a further <b>two</b> marks for each linked descriptive point.</p> <p>Transverse plane (1) divides the body into top and bottom.<br/>           (1) Movements in this plane are rotational/twisting (1)</p> <p>Accept any other appropriate answers.</p> | 3    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 8               | <p>Answer should contain 4 linked points, which, in combination, provide a logical description of the mechanism of inspiration.</p> <p>The diaphragm contracts and moves downwards/flattens<br/>           (1) the external intercostal muscles contract and raise<br/>           move up and outwards the rib cage (1) increasing the<br/>           volume of the thoracic cavity (1) decreasing the pressure<br/>           in the lungs so air is drawn into the lungs (1)</p> <p>Accept any other appropriate answer.</p> | 4    |

| Question Number | Answer   | Mark |
|-----------------|--|------|
| 9               | <p>Award <b>one</b> mark for identification of the function and one mark for each explanatory point, up to a maximum of three marks.</p> <p>The function of the alveoli is to allow gaseous exchange / diffusion (1)<br/> this is possible due to the selectively / semi permeable membrane (1)<br/> and the close proximity / short diffusion pathway from the alveoli to the capillaries (1)<br/> which allows oxygen into the blood and carbon dioxide to be breathed out (1)</p> <p>Accept any other appropriate answer.</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>Indicative content</b></p> <p><b>Neural control</b></p> <ul style="list-style-type: none"> <li>• The sinoatrial node (SAN) initiates the electrical/cardiac impulse</li> <li>• This travels through the atria and causes them to contract</li> <li>• The impulse reaches the atrioventricular node (AVN) found in the right atrium/septum</li> <li>• This passes the impulse down the bundle of His found in the septum</li> <li>• This then branches into the ventricle walls via a network of Purkinje fibres, which causes the ventricles to contract</li> </ul> <p><b>Cardiac cycle</b></p> <ul style="list-style-type: none"> <li>• The cardiac cycle is the sequence of events that occurs when the heart beats</li> <li>• There are two phases of the cardiac cycle; diastole and systole</li> <li>• In the diastole phase, the heart ventricles are relaxed and the heart fills with blood</li> <li>• In the systole phase, the ventricles contract and pump blood to the arteries</li> </ul> | 8    |

|  |   |  |
|--|---|--|
|  | <ul style="list-style-type: none"> <li>As the heart beats, it circulates blood through pulmonary and systemic circuits of the body</li> </ul> <p>Accept any other appropriate answer.</p> |  |
|--|---|--|

| 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 interrelationships or linkages in a sustained manner.</li> </ul> |



| Question Number    | Answer  | Mark                             |                          |                   |                |                   |          |                 |                                  |           |          |       |       |                             |         |          |       |                           |                     |                          |          |   |
|--------------------|---|----------------------------------|--------------------------|-------------------|----------------|-------------------|----------|-----------------|----------------------------------|-----------|----------|-------|-------|-----------------------------|---------|----------|-------|---------------------------|---------------------|--------------------------|----------|---|
| 11                 | <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>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 the skeletal system. Additional information demonstrating knowledge of the skeletal system can be provided, to show a deeper understanding. Marks will be awarded in relation to the detail and depth of coverage the movement.</p> <table border="1" data-bbox="405 875 1209 1193"> <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>Humerus<br/>Scapula<br/>(Clavicle)</td> <td>Extension</td> <td>Sagittal</td> </tr> <tr> <td>Elbow</td> <td>Hinge</td> <td>Humerus<br/>Ulna<br/>(Radius)</td> <td>Flexion</td> <td>Sagittal</td> </tr> <tr> <td>Trunk</td> <td>Gliding/<br/>cartilaginous</td> <td>Vertebral<br/>column</td> <td>Extension/no<br/>movement</td> <td>Sagittal</td> </tr> </tbody> </table> <p><b>Additional factors responsible for movement</b><br/>Joint shape determines range of motion, due to shape of articulating surfaces and arrangement of other structures supporting the joint, e.g. ligaments, knowledge of which bones are the axial and appendicular skeleton.</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 row 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 radius 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> </ul> | Joint/Area of body               | Type of joint            | Bones             | Joint movement | Plane of movement | Shoulder | Ball and socket | Humerus<br>Scapula<br>(Clavicle) | Extension | Sagittal | Elbow | Hinge | Humerus<br>Ulna<br>(Radius) | Flexion | Sagittal | Trunk | Gliding/<br>cartilaginous | Vertebral<br>column | Extension/no<br>movement | Sagittal | 8 |
| Joint/Area of body | Type of joint   | Bones                            | Joint movement           | Plane of movement |                |                   |          |                 |                                  |           |          |       |       |                             |         |          |       |                           |                     |                          |          |   |
| Shoulder           | Ball and socket   | Humerus<br>Scapula<br>(Clavicle) | Extension                | Sagittal          |                |                   |          |                 |                                  |           |          |       |       |                             |         |          |       |                           |                     |                          |          |   |
| Elbow              | Hinge   | Humerus<br>Ulna<br>(Radius)      | Flexion                  | Sagittal          |                |                   |          |                 |                                  |           |          |       |       |                             |         |          |       |                           |                     |                          |          |   |
| Trunk              | Gliding/<br>cartilaginous   | Vertebral<br>column              | Extension/no<br>movement | Sagittal          |                |                   |          |                 |                                  |           |          |       |       |                             |         |          |       |                           |                     |                          |          |   |

|  |  |  |
|--|--|--|
|  | <ul style="list-style-type: none"> <li>In the picture, we can see the athlete's elbow is in flexion as the joint angle at the elbow has decreased, in order to allow a bend in the arm.</li> </ul> <p><b>Trunk</b></p> <ul style="list-style-type: none"> <li>Gliding/Cartilaginous joint.</li> <li>The joint is formed by the articulation of the vertebrae in the vertebral column.</li> <li>Unlike other synovial joints, there is limited movement at gliding/cartilaginous joints in order to limit injury.</li> <li>Flexion, extension and some rotation is permitted at the joints in the trunk.</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 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 3 | 7-8  | <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> |

| Question Number | Answer | Mark |
|-----------------|--------|------|
|-----------------|--------|------|

12.

14

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.

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 awarded in relation to the detail and depth of coverage of movement.

**Preparation to execution phase**

| Joint | Type of joint   | Bones                        | Planes of movement | Joint movement | Muscles  | Muscle contraction |
|-------|-----------------|------------------------------|--------------------|----------------|--|--------------------|
| Hip   | Ball and socket | Femur<br>Pelvis              | Sagittal           | Extension      | Agonist – Gluteals<br><br>Antagonist – Iliopsoas/Hip flexors         | concentric         |
| Knee  | Hinge           | Femur<br>Tibia<br>(Fibula)   | Sagittal           | Extension      | Agonist – Quadriceps<br><br>Antagonist – Hamstrings                  | concentric         |
| Ankle | Hinge           | Tibia<br>Tarsals<br>(Fibula) | Sagittal           | Plantarflexion | Agonist – Gastrocnemius/Soleus<br><br>Antagonist – Tibialis anterior | concentric         |

All three joints are synovial joints, allowing 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.

**Hip**

- Ball and socket joint.
- The joint is formed by the articulation of the femur and pelvis.
- Although a great range of movement of possible at the hip, due to the shape made by the articulating bones, the movement is an extension of the hip to allow the body to stand up.
- The muscles that bring about extension of the hip are the gluteals. The gluteals are the agonist muscle. In order for the gluteals to contract, the antagonist, in this case the iliopsoas/hip flexor, must relax.
- As the gluteals contract they shorten, pulling on the bone attached to the muscle insertion point allowing the body to stand up.
- As there is movement at the hip in the athlete when performing the movement, the type of contraction is concentric.

**Knee**

- Hinge joint.
- The joint formed by the articulation of the femur and tibia.
- As the knee 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 athlete extends at the knee joint to allow for force transmission to stand up.
- The muscles that bring about extension at the knee are the quadriceps. The quadriceps are the agonist muscle. In order for the quadriceps to contract, the antagonist, in this case the hamstrings, must lengthen.
- As the quadriceps contract, they shorten, pulling on the bone attached to the muscle insertion point. The hamstrings are lengthening and relaxing.
- As there is movement at the knee, in this phase the quadriceps are contracting concentrically.

#### **Ankle**

- Hinge joint.
- The joint is formed by the articulation of the tibia and tarsals.
- As the ankle is a hinge joint, movement is only possible in one plane, the sagittal plane.
- Plantarflexion and dorsiflexion occurs in the sagittal plane. In the picture, we can see the athlete plantarflexes at the ankle joint to allow for force transmission.
- The muscles that bring about plantarflexion at the ankle are the gastrocnemius. The gastrocnemius and soleus are the agonist muscles. In order for the gastrocnemius and soleus to contract, the antagonist, in this case the tibialis anterior, must lengthen.
- As the gastrocnemius contracts it shortens, pulling on the bone attached to the muscle insertion point.
- The athlete plantarflexes at the ankle to transmit force.

#### **Additional factors in the analysis of movement**

The role of the fixator, types of contraction, with relevant examples to the joints in question context.

The role of the synergist, types of contraction, with relevant examples to the joints in question context.

Stability and mobility at joints.

Transfer of movement across body segments.

| <b>Level</b> | <b>Mark</b> | <b>Descriptor</b>  |
|--------------|-------------|--|
| 0            | 0           | • No rewardable material.  |
| 1            | 1–5         | • Demonstrates isolated elements of knowledge and understanding. |

|   |       |   |
|---|-------|---|
|   |       | <ul style="list-style-type: none"> <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>  |
| 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>     |
| 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 interrelationships or linkages in a sustained manner.</li> </ul> |

Ofqual



Llywodraeth Cymru  
Welsh Assembly Government



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