



Mark Scheme

(Results)

January 2019

Pearson BTEC Level 3 Sport and  
Exercise Science

Unit 2: Functional Anatomy

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## BTEC Next Generation Mark Scheme Template

### Functional Anatomy - Unit 2 - 1901

Question Number	Answer										
1 Expert	<p>Award <b>one</b> mark for the identification of type of bone, award <b>one</b> further mark for the related example.</p> <table border="1"> <tr> <td>Type of bone</td> <td>Example (accept appropriate alternatives)</td> </tr> <tr> <td>Flat bone (1)</td> <td>sternum (1)</td> </tr> <tr> <td>Long bone (1)</td> <td>femur (1)</td> </tr> <tr> <td>Irregular bone (1)</td> <td>vertebrae (1)</td> </tr> <tr> <td>Short bone (1)</td> <td>carpals (1)</td> </tr> </table> <p>Accept any other appropriate answers.</p>	Type of bone	Example (accept appropriate alternatives)	Flat bone (1)	sternum (1)	Long bone (1)	femur (1)	Irregular bone (1)	vertebrae (1)	Short bone (1)	carpals (1)
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Irregular bone (1)	vertebrae (1)										
Short bone (1)	carpals (1)										

Question Number	Answer	Mark
2a Expert	<p>Award <b>one</b> mark for stating a function of the pulmonary vein.</p> <p>Carries blood from the lungs to (left side of the) heart (1)</p> <p>Accept any other appropriate response.</p>	1
2b Expert	<p>Award <b>one</b> mark for stating a function of the aorta.</p> <p>Carries blood away from the heart to the body (1)</p> <p>Takes (oxygenated) blood from the left ventricle to the muscles/cells (1)</p> <p>Accept any other appropriate response.</p>	1

Question Number	Answer
3 grad	<p>Award <b>one</b> mark for the identification of each of correct structure.</p> <p>A – Actin / Troponin / Tropomyosin (1)</p> <p>B – Z line (1)</p>

Question Number	Answer	Mark
4 Expert	<p>Award <b>one</b> mark for the identification of the function of plasma and <b>one</b> further mark for appropriate expansion.</p> <p>The function of plasma is for transportation (1) of blood cells/nutrients/waste products throughout the body (1)</p> <p>Plasma is used for thermoregulation (1) by supplying sweat glands with fluid (1)</p> <p>Accept any other appropriate responses.</p>	2

Question Number	Answer	Mark
5 Expert	<p>Award <b>one</b> mark for identifying the function and up to <b>two</b> marks for each linked descriptive point.</p> <p>Oxygen concentration is high in the lungs as it has just been inhaled (1) and low in the blood because it has been utilised by muscles (1). Therefore, oxygen will move from an area of high concentration (in the alveoli) to low concentration (in the blood) (1)</p> <p>The alveoli have a semi permeable membrane (1) which allows oxygen to diffuse through it (1). In the lungs, oxygen will move from an area of high concentration to low concentration (1)</p> <p>Accept any other appropriate answers.</p>	3

Question Number	Answer	Mark
6a Grad	<p>Award <b>one</b> mark for each correct identification.</p> <p>A – Trachea B – Bronchus/Bronchi</p>	2

Question Number	Answer	Mark
6b Expert	<p>Award <b>one</b> mark for identification of a function and up to <b>two</b> marks for each descriptive point.</p> <p>The diaphragm <u>contracts</u> (1) and moves downwards (1) increasing the volume of the thoracic cavity (1)</p> <p>The diaphragm contracts/moves downwards (1) decreasing the pressure in the lungs (1) so air is drawn into the lungs (1)</p> <p>Accept any other appropriate answers.</p>	3

Question Number	Answer	Mark
7a Expert	<p>Award <b>one</b> mark for identification of fibre type and <b>one</b> mark for related explanatory point.</p> <p>Shot putter recruits Type II/2x/b/fast glycolytic/FTG muscle fibres (1) because the throw requires high intensity/explosive/forceful/powerful muscle contractions (1)</p> <p>Type IIx/b/FG/FTG muscle fibres (1) as these fibres produce high force (1)</p> <p>Accept any other appropriate answers.</p>	2

Question Number	Answer	Mark
7b Expert	<p>Award <b>one</b> mark for identification of fibre type and <b>one</b> mark for related explanatory point.</p> <p>5000 m runner recruits Type I/Slow Twitch muscle fibres (1) because it is low intensity to allow for sustained muscle contraction/low force over the length of the race / long time (1)</p> <p>Type I/slow twitch muscle fibres (1) as they have a very high resistance to fatigue (1)</p> <p>Accept any other appropriate answers.</p>	2

Question Number	Answer	Mark
8a Grad	<p>Award <b>one</b> mark for the correct identification of the blood vessel.</p> <p>Veins Venoules Vena cava</p>	1
8b Expert	<p>Answer should contain a logical description of the function of the arterioles to control blood flow, up to <b>three</b> marks.</p> <p>Arterioles contain a lumen/smooth muscle (1) which can dilate (1) to increase blood flow (1)</p> <p>Vasodilation occurs (1) where the walls widen/dilate/increase in diameter (1) to increase blood flow (1)</p> <p>Acceptable any other suitable responses.</p>	3

Question Number	Answer	Mark
9 Expert	<p>Award <b>one</b> mark for identification of function and <b>one</b> mark for each explanatory point.</p> <p>The ligaments stabilise the joint (1) because they attach bone to bone (1) therefore preventing unwanted movement (1) such as hyperextension when kicking the ball (1)</p> <p>The ligaments have to be a strong fibrous tissue/inelastic (1) because they attach bone to bone (1) which stabilises the joint (1) and prevent unwanted movement/hyperextension (1)</p> <p>Accept any other appropriate answer.</p>	4

Question Number	Answer	Mark
10 Expert	<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>Basic Knowledge</b></p> <ul style="list-style-type: none"> <li>• Chemoreceptors are located in blood vessels</li> <li>• Chemoreceptors detect chemical changes in the bloods</li> <li>• Example of Blood Chemical changes in the blood ( CO<sub>2</sub>/blood pH/acidity)</li> </ul> <p><b>Explained in relation to exercise</b></p> <ul style="list-style-type: none"> <li>• Exercise produces increased levels of carbon dioxide in the blood</li> <li>• High levels of carbon dioxide decrease <u>blood</u> pH/more acidic/weak acid/carbonic acid</li> <li>• They relay information to the respiratory control centre/RCC in the medulla oblongata</li> <li>• Information is relayed via the phrenic nerve/neural impulses</li> </ul> <p><b>Application to exercise – what changes occur</b></p> <ul style="list-style-type: none"> <li>• Activates the breathing muscles</li> <li>• Diaphragm and intercostal muscles work/contract harder</li> <li>• Leading to an increase breathing rate</li> <li>• and increased depth of breathing/tidal volume</li> </ul>	8

	<ul style="list-style-type: none"> <li>• to speed up gas exchange</li> <li>• to meet the increased demand for oxygen at the working muscles</li> <li>• remove CO<sub>2</sub> quicker/remove more CO<sub>2</sub>/remove CO<sub>2</sub> <ul style="list-style-type: none"> <li>○ /neutralise the blood</li> </ul> </li> </ul>	
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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>• Provides little or no reference to the question context.</li> <li>• Generic statements may be presented, rather than linked factors/components being identified and explored in the context of the question. Limited attempt is made to address the question.</li> <li>• Response is likely to lack clarity, organisation and the required technical language.</li> </ul>
Level 2	4-6	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Provides references to relevant information in relation to the question context.</li> <li>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, in the context of the question. The accuracy in the detail on the factors identified is likely to vary.</li> <li>• The response may contain parts that lack clarity or proper organisation. There will be evidence of correct technical language being used.</li> </ul>
Level 3	7-8	<ul style="list-style-type: none"> <li>• Demonstrates accurate knowledge and understanding.</li> <li>• Provides sustained references to relevant information, in relation to the question context.</li> <li>• A contextualised analysis is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships.</li> <li>• Response demonstrates good organisation, clarity and use of technical language.</li> </ul>

Question Number	Answer	Mark																				
11 Expert	<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> <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="405 678 1209 913"> <thead> <tr> <th>Joint 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>Hip</td> <td>Ball and socket</td> <td>Femur Pelvis</td> <td>Flexion</td> <td>Sagittal</td> </tr> <tr> <td>Knee</td> <td>Hinge</td> <td>Femur Tibia</td> <td>Flexion</td> <td>Sagittal</td> </tr> <tr> <td>Trunk</td> <td>Gliding/ cartilaginous</td> <td>Vertebral column</td> <td>Rotation</td> <td>Transverse</td> </tr> </tbody> </table> <p><b>Additional factors responsible for movement</b></p> <ul style="list-style-type: none"> <li>• Joint shape determines range of movement</li> <li>• Shape of articulating surfaces</li> <li>• Types of movements available at those joints.</li> <li>• Knowledge of bones of axial and appendicular skeleton</li> </ul> <p><b>Hip</b></p> <ul style="list-style-type: none"> <li>• Ball and socket joint.</li> <li>• The joint is formed by the articulation of the femur and pelvis.</li> <li>• Although a great range of movement is possible at the hip due to the shape made by the articulating bones, to achieve the lunge position shown, the movement in the front leg is a flexion of the hip, as the athlete has lowered his body to achieve the lunge position.</li> </ul> <p><b>Knee</b></p> <ul style="list-style-type: none"> <li>• Hinge.</li> <li>• The joint is formed by the articulation of the femur and tibia.</li> <li>• As the knee 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 athlete's knee is in flexion as the joint angle at the knee has decreased, in order to achieve a lunge position.</li> </ul>	Joint of body	Type of joint	Bones	Joint movement	Plane of movement	Hip	Ball and socket	Femur Pelvis	Flexion	Sagittal	Knee	Hinge	Femur Tibia	Flexion	Sagittal	Trunk	Gliding/ cartilaginous	Vertebral column	Rotation	Transverse	8
Joint of body	Type of joint	Bones	Joint movement	Plane of movement																		
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Trunk	Gliding/ cartilaginous	Vertebral column	Rotation	Transverse																		



	<p><b>Trunk</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Gliding/cartilaginous joint.</li> <li><input type="checkbox"/> The joint is formed by the articulation of the vertebrae in the vertebral column.</li> <li><input type="checkbox"/> There is limited movement at gliding/cartilaginous joints in order to limit injury.</li> <li><input type="checkbox"/> Rotation is permitted at the joints in the trunk and occurs in the transverse plane.</li> </ul>	
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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>• Provides little or no reference to the question context.</li> <li>• Generic statements may be presented, rather than linked factors/components being identified and explored, in the context of the question. Limited attempt is made to address the question.</li> <li>• Response is likely to lack clarity, organisation and the required technical language.</li> </ul>
Level 2	4–6	<ul style="list-style-type: none"> <li>• Demonstrates mostly accurate knowledge and understanding.</li> <li>• Provides references to relevant information, in relation to the question context.</li> <li>• Learners will identify linked factors/components, with some development in the form of mostly accurate and relevant factual material, in the context of the question. The accuracy in the detail on the factors identified is likely to vary.</li> <li>• The response may contain parts which lack clarity or proper organisation. There will be evidence of correct technical language being used.</li> </ul>
Level 3	7–8	<p>Demonstrates accurate knowledge and understanding.</p> <ul style="list-style-type: none"> <li>• Provides sustained coverage of relevant information, in relation to the question context. Might demonstrate the ability to integrate and synthesise relevant information.</li> <li>• A contextualised analysis is developed using mostly coherent chains of reasoning, leading to a range of factors/components being present. Learners will demonstrate understanding of linkages and relationships.</li> <li>• Response demonstrates good organisation, clarity and use of technical language.</li> </ul>

Question Number	Answer	Mark																												
12. Expert	<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>Preparation to execution phase</p> <table border="1" data-bbox="327 616 1460 1041"> <thead> <tr> <th>Joint</th> <th>Type of joint</th> <th>Bones</th> <th>Planes of movement</th> <th>Joint movement</th> <th>Muscles</th> <th>Muscle contraction</th> </tr> </thead> <tbody> <tr> <td>Elbow</td> <td>Hinge</td> <td>Humerus (Radius) Ulna</td> <td>Sagittal</td> <td>Flexion</td> <td>Agonist – Biceps Antagonist – Triceps</td> <td>concentric</td> </tr> <tr> <td>Ankle</td> <td>Hinge</td> <td>Tibia Tarsals (Fibula) (Talus)</td> <td>Sagittal</td> <td>Plantar Flexion</td> <td>Agonist – Gastrocnemius Antagonist – Tibialis Anterior</td> <td>concentric</td> </tr> <tr> <td>Shoulder</td> <td>Ball and socket</td> <td>Scapula Humerus (Clavicle)</td> <td>Frontal</td> <td>Horizontal flexion/adduction</td> <td>Agonist – Anterior deltoid / pectoralis major Antagonist – Posterior deltoid/trapezius</td> <td>concentric</td> </tr> </tbody> </table> <p>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.</p> <p><b>Elbow</b></p> <ul style="list-style-type: none"> <li>• Hinge joint.</li> <li>• The joint formed by the articulation of the humerus, radius and ulna.</li> <li>• As the elbow is a hinge joint, movement is only possible in one plane, the sagittal plane.</li> <li>• Flexion and extension occur in the sagittal plane. In the picture, we can see the athlete flexes at the elbow joint to allow for force transmission of the racket on the ball.</li> <li>• The muscles that bring about flexion at the elbow are the biceps. The biceps are the agonist muscle. In order for the biceps to contract, the antagonist, in this case the triceps, must lengthen.</li> <li>• As the biceps contract, they shorten, pulling on the radius attached to the muscle insertion point. The triceps are lengthening and relaxing.</li> <li>• As there is movement at the elbow, in this phase the biceps are contracting concentrically.</li> </ul> <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.</li> </ul>	Joint	Type of joint	Bones	Planes of movement	Joint movement	Muscles	Muscle contraction	Elbow	Hinge	Humerus (Radius) Ulna	Sagittal	Flexion	Agonist – Biceps Antagonist – Triceps	concentric	Ankle	Hinge	Tibia Tarsals (Fibula) (Talus)	Sagittal	Plantar Flexion	Agonist – Gastrocnemius Antagonist – Tibialis Anterior	concentric	Shoulder	Ball and socket	Scapula Humerus (Clavicle)	Frontal	Horizontal flexion/adduction	Agonist – Anterior deltoid / pectoralis major Antagonist – Posterior deltoid/trapezius	concentric	14
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	<ul style="list-style-type: none"> <li>• Plantar flexion and dorsi flexion are movements only focused on the ankle. In the picture, we can see the athlete plantar flexes the joint to allow for the effective movement of jumping up to make contact with the ball.</li> <li>• The muscles that bring about plantar flexion at the ankle are the gastrocnemius. This are the agonist muscle, the antagonist in this case is the tibialis anterior.</li> <li>• The athlete plantar flexes the ankle to transmit force.</li> <li>• The muscle contraction is concentric.</li> </ul> <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, humerus and clavicle.</li> <li>• A great range of movement is possible at the shoulder, due to the shape made by the articulating bones. The movement is horizontal flexion, as the angle of the joint gets smaller to allow the racket to be brought across the body.</li> <li>• The muscles that bring about flexion of the shoulder are the anterior deltoid and pectoralis major. The posterior deltoid is the antagonist muscle. In order for the agonist to contract, the antagonist must relax and lengthen.</li> <li>• As anterior deltoid contracts it shortens, pulling on the humerus.</li> <li>• The type of contraction is concentric.</li> </ul> <p><b>Additional factors in the analysis of movement</b></p> <ul style="list-style-type: none"> <li>• The role of the fixator and/or synergist muscles, types of contraction, made clear to the joint being analysed.</li> <li>• Stability and mobility of joints in the kinetic chain.</li> <li>• Transfer of movement across body segments.</li> </ul>	
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Level	Mark	Descriptor
0	0	No rewardable material.
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>
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 Cynulliad Cymru  
Welsh Assembly Government



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